

# The Iron Age

A Review of the Hardware, Iron and Metal Trades.

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## Portable Engine.

The J. C. Hoadly Company, of Lawrence, Mass., manufacture a line of portable engines which are worthy of note. Our illustration represents the nine horse-power. It is mounted on wheels with 2½ inches face when of wood, or it can be had with a wagon having iron wheels 5 inches face. The axles are of iron, and the boiler has ashpan, a seat for the driver with a foot-board, suction-hose, strainer, etc. All the conveniences in fact are furnished with the machine.

The engine itself is of the horizontal pattern, carried on the boiler which serves as a frame. A balanced piston valve is used, and by means of an eccentric of variable throw, regulated by a governor in the fly-wheel, an automatic cut-off is obtained. The cylinder is steam jacketed, the guide bars chilled iron, with ground surfaces arranged to admit of careful adjustment.

The check is fitted with a patent stop-valve, for closing the passage to allow the removal of the check-valve for wiping, if obstructed, without danger of bursting pump or pipes on starting the pump.

The manufacturers say that the engine, under favorable circumstances, with attention can be run so as to develop a horse-power with the consumption of 3.2 pounds of coal per hour, and while they do not expect this economy to be attained in ordinary practice, they say that with good care the consumption should not be more than 3.5 pounds of coal per horse-power per hour. Messrs. R. H. Allen, of 189 Water street, are the agents in this city.

## Double-Acting Spring Butt.

The Sabin Manufacturing Co., Montpelier, Vermont, are making a double-acting spring butt which they claim has several very important advantages. These butts, of which we publish two illustrations on this page, are made with two leaves. In order to obtain greater strength and steadiness in holding the door they are made with strong flanges at right angles to the leaf, this results in an additional gain, as the screws can be driven from the outside instead of going into the edge of the door. The butt can be put on without opening the leaves and without the use of a strip between the stile of the door and the jamb. On the back of the butt is a very strong volute spring which draws in a direct line with the center of the door. This holds the door in position and at the same time prevents the tendency to sag which is frequently so annoying in doors of this kind. This butt was patented April 18, 1876.

## Scientific and Technical Notes.

Experiments by Profs. Marker and Schultze show that under some circumstances the PASSAGE OF AIR AND GASES THROUGH WALLS AND BRICK WORK

is by no means difficult. All that is necessary to promote the passage is a difference of temperature of 10 deg. between the inside and outside air. The figures given are as follows, per hour, for each square yard of wall surface: Through sandstone, 3.7 cubic feet; through quarried limestone, 6.5; through brick, 7.9; through turfy limestone, 10.1. This fact of the penetration and flow of gases through stone has one important bearing on the construction of wholesome residences. Most people are under the impression that if a cellar is lined with Portland cement, the dampness and malaria of the earth beneath will be shut off. If not in some way prevented, earth vapors pass upward into the building, and that part of the process is usually hastened in the winter months by a furnace in the cellar. Doubtless many malarial diseases, such as typhoid fever and diphtheria, may thus be propagated in cities, especially where the building sites are imperfectly drained or are "made ground." The experiments referred to are an additional proof that a Portland cement lining will not cut off the malarious gases, as indeed might also be inferred from its porous character. The only effective barrier against foul air and dampness must be some substance which is not permeable. Probably this result might be attained by means of a layer of asphalt or bitumen, if it were evenly spread, and weighted so as to keep in place. In view of the estimate that half the diseases of mankind are preventable, it is not too much to hope that modern sanitary improvements may largely reduce the death rate in cities; with many residences the improvement needs to begin at the bottom.

The Pennsylvania railroad have adopted a very effective method of

INDICATING THE SPEED OF TRAINS AT NIGHT by means of properly arranged signal lights. The invention was made we believe by a Mr. Needham, of Cincinnati, Ohio. It consists of a flashing light that indicates the speed and distance of a train and shows whether it is at rest or in motion. This light is of two colors, one of them red and the other white, placed on the caboose, so that they may be seen in both directions on the line. A simple device for hiding the light at intervals is affixed to each lamp, so that it may be made to alternately appear and disappear, and by suitable gearing this is connected with one of the axles of the car. While the car is at rest the lights are

steadily visible; when the train moves the lights flash once for a given number of revolutions of the wheels, and thus its movement and actual speed can be easily estimated as far as the lights can be seen. In fact the distance is very accurately indicated by the disappearance of the red light, the flashing of the white light being only visible at the greater distances.

The French are experimenting in the propulsion of street cars, and Mr. Mekarski has invented a

COMPRESSED AIR AND STEAM STREET CAR which has recently been tried upon a Parisian street railroad. The framing is supported on two axles, rather near together, to facilitate the passage around curves, the inventor being evidently ignorant that a car with greater spread of wheels will take a curve easier than one where the spread is

being composed of one or more cylindrical metallic vessels containing compressed air at high pressure—from 20 to 30 atmospheres—according to the power required. The compressed air in each receiver acts by its elasticity similar to a spring, either direct or by means of a piston, on the water supply contained also in one or more cylindrical vessels. The water under pressure in the reservoirs or receivers puts in motion the mechanism, thus giving rotary motion to the wheels of the car. The mechanism is put in motion by an ordinary hydraulic capstan, or by the multiple cylinder or cyclo-dynamic apparatus. About midnight, on a line or network of tramways or at any other point of the same line, a motive-power engine is arranged in combination with pumps and apparatus—in a similar manner to those employed in ports, docks or warehouses, where the lift-

the molten tin in which is covered with a layer of tallow. The tallow prevents the tin from oxidizing during the operation, and the goods come out bright. The coppering of the goods before tinning facilitates the latter operation, which may be conducted at a heat such that the goods run no risk of warping. These directions may give some useful hints to those of our readers who have been attempting the retinning process, and from whom we have frequently had letters asking for information in regard to the best method of securing a fine surface, etc.

## The Guilds of the City of London.

The returns of liverymen and freemen entitled to vote for members of Parliament for the City of London belonging to the 89 City Guilds, and issued by those bodies, pre-

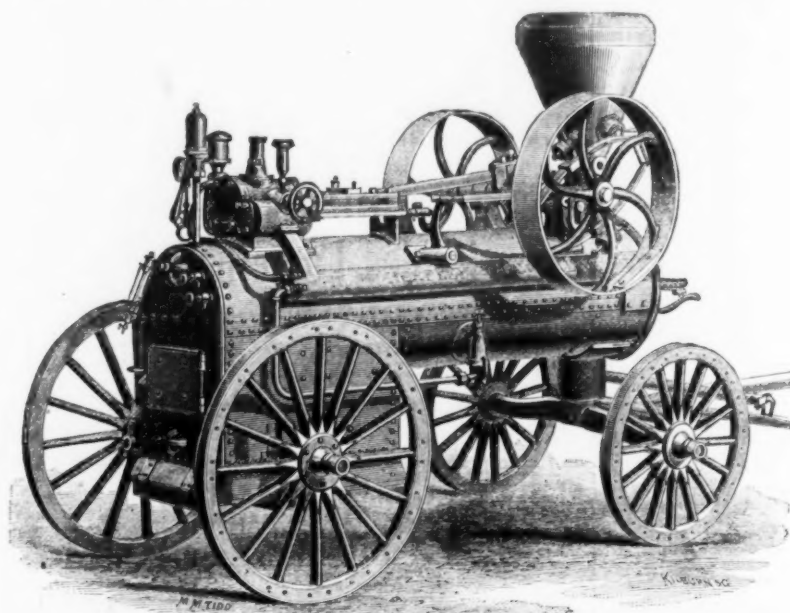
Mr. Philip Twells, and the Right Hon. J. A. Stuart Wortley. An analysis shows that royalty affects the fishmongers and merchant tanners, the clergy adopt the drapers, while the list of the felt makers and spectacle makers include the names of the most distinguished members of the Cabinet and House of Commons generally.

## The Commercial Basis for an American Merchant Marine.

The St. Louis Commercial says: An examination of the Treasury statistics in regard to merchant ships engaged in the foreign trade of the United States, published in the annual volume for 1876, reveals a curious fact. There arrive in this country annually from foreign countries other than Canada an average of 4000 ships in ballast seeking cargoes, about 2600 being from Europe, and 700 from Cuba. There cleared from the United States for countries other than Canada an average of only about 500 ships in ballast seeking cargoes, of which number 20 are bound for Europe, 200 are for Cuba, 80 are for whale fisheries, and the rest scattering. In other words, a vast fleet of large ships built for the ocean carrying trade, mostly foreign, comes to the different ports of this country, North and South, every year, empty; and 3500 out of 4000 of them go away loaded with heavy cargoes, the produce and growth of the United States. This might be considered, perhaps, as merely a statistical statement of a truth which has been known in a general way to foreign shipmasters for a long time, namely, that a cargo can always be obtained in the United States; but it is in all respects a striking fact. Not only do the largest cargoes go out from this country, particularly to Europe, but the largest number of cargoes; and the shipmaster cruising about the world for something to do can as certainly command a load of grain, cotton, provisions and merchandise on the United States seaboard as he can guano or nitrate in Peru, or coffee in Brazil. This fact speaks with a ringing voice to Americans. It declares that if they have not as large a share of the ocean carrying trade as they want, it is their own fault. Our shipbuilders are now building wool and iron ships as cheaply as the English; hence, if it is not American ships which carry American products abroad, it is because Americans cannot sail their ships as cheaply as other nations, or because they cling to the old-fashioned and expensive wooden vessels.

The Social Science Congress to convene at Aberdeen, in Scotland, this year, will treat subjects which are of paramount concern all over the world at this time. The best method of housing the laboring classes in town and country and providing for the sanitary welfare of those engaged in the coast fisheries; the principles to be observed in restoring and preserving old buildings; the effect of competition upon art progress and the introduction of art into the houses of common people will be debated; and with these topics the congress will consider the causes of depression in trade over the world now, and the effect of trades unions, strikes and lock-outs. More might perhaps be hoped from these essays and discussions but for the special theories which color all British thought concerning some of the topics. These cannot, however, govern all that is said in relation to business depression and strikes and lock-outs; and it is quite possible there may be a valuable addition to what we should know about the causes of the prolonged depression in business everywhere, which, fairly understood, will enable intelligent steps to be taken against them and for recovery. Each country has for some time attributed its sufferings to local causes. So long as the evil was misunderstood the attempted remedies must fail. The congress has abundance of explanations to select from, and all will hope that its verdict may be correct and its conclusions complete.

An invention that seems likely to counteract the most frequent cause of fires that break out in the wreck of railway trains, is announced from Omaha. Such fires are in the majority of instances kindled from coals that are thrown at the time of the accident out of the stoves which are used to heat the cars, and it is easily capable of proof that the burning of railway wrecks occurs much more frequently during the seasons of the year when cars are heated than when stoves are not used. The ingenuity of inventors has been chiefly directed toward obviating this risk by making the stoves so secure as not to spill the fuel when upset, but such contrivances meet only partial success, because of the possibility that the concussion may be so violent as to break the stove to pieces. There have been several ingenious devices for obtaining heat without fuel-burning stoves, but they do not seem to have met the want, though one of them—a foot stove in which lime was slacked—was said to be successful in Germany, but would not be likely to serve in our climate. The invention shown at Omaha is of a much simpler kind. Its design is to put out the fire in a stove, in case the stove is wholly or partially upset. This is accomplished by surrounding the stove with a jacket containing water. Openings in the jacket communicate with the interior of the stove, so that if the car is much tilted from a level, the water will flow into the stove and extinguish the fire. If the details of the invention are as simple as its essential idea, there should be nothing in the way of its success.

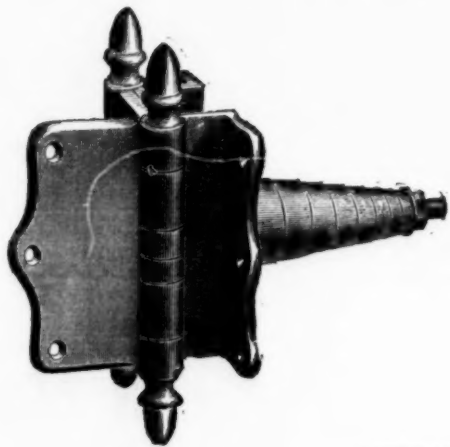


IMPROVED PORTABLE ENGINE.

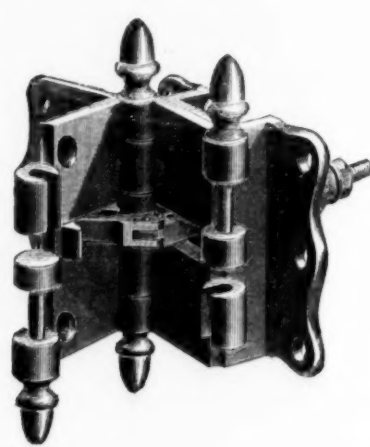
very small. The body contains seats for sixteen passengers, while standing room is afforded for fourteen more on the rear platform; in front there is another platform of smaller dimensions for the driver. Air-tight cylindrical reservoirs for compressed air are connected together by copper pipes, and are divided into two series, the larger constituting the principal motive agency, and the smaller, of one-third the volume, constituting the reserve. On leaving

apparatus is actuated by hydraulic pressure. For this purpose a pipe or tube for conducting water under pressure is laid down along the whole line of the tramway or its branches, and in communication with a reservoir or receiver, and at suitable distances apart valves or taps are placed in the pipe, in order to supply water under pressure to the cars of the train, these being placed at certain stations in communication with the reservoir. It is at these different points

sent some curious anomalies. Among those free to follow the double profession of a fishmonger or merchant tailor, or either of them, are their Royal Highnesses the Prince of Wales, the Dukes of Edinburgh, Connaught and Cambridge, and the Earls of Beaconsfield and Granville. The list of those who by their freedom are entitled to vote as fishmongers are Mr. Gladstone, the two Barons Rothschild, the Recorder of London and Sir H. W. Peck, M. P. Sir Bartle Frere, Sir



DOUBLE-ACTING SPRING BUTT.



ing the reservoirs, the compressed air passes through a column of hot water, in which it becomes saturated with steam at high temperature; this water, which is introduced before starting into the heating chamber at a temperature of 338 to 356, Fah., gradually parts with its heat during the journey, so that its temperature becomes reduced to from 212 to 248, at the end of the course. In the upper part of the heating chamber, therefore, is contained a mixture of air and steam, at the pressure of the reservoirs. Instead of discharging this gaseous mixture directly into the working cylinders at a pressure which is necessarily variable and continually decreasing, a reducing apparatus is used by which the pressure can be adjusted. Once set the valve automatically regulates the pressure of the gases delivered to the cylinders. The driving mechanism, as we understand the descriptions, is essentially the same as that of the locomotive.

Another French gentleman, Mr. Rosseau, of Brussels, is proposing a very curious HYDRAULIC SYSTEM OF STREET CAR PROPULSION,

which is certainly one of the most remarkable propositions put forward for a long time. A hydraulic apparatus is the motive power. In order to maintain the water stored in each car under pressure, a receiver is fixed either horizontally or vertically under the floor of the car, this receiver

or stations that each car completes or renews and stores away the necessary quantity of water under pressure which is required to enable it to act automatically in the distance comprised between two hydrants for taking in the water.

Tinning Sheet Iron Goods.—On the authority of an English scientific paper we have the following directions for tinning sheet iron goods made up "black," or from untinned sheet iron: "In tinning thin cast iron goods of this kind they run the risk of losing part of their substance by the filing or friction necessary for the removal of the oxide with which they are coated, or of twisting out of shape in the furnace if the oxide is removed by heat. They run the same risk from heat employed in the ordinary process of tinning. Where it is of consequence to avoid these evils, the first may be obviated by scouring with sand and a solution of 2 parts sulphuric acid in 8 of water until the rust vanishes. The goods are then washed with fair water and set in a solution of 1 part sulphate of copper in 5 parts water. Here they are left till they have become coated with a faint red coating of copper, which is cleansed with sand and water. They are now brushed with a solution of chloride of zinc and dipped at once into the melted tin. If it is desired to give brilliancy to the tinning, the goods are again dipped, the second time in a second vessel,

Samuel Baker, and Sir Gilbert Scott are returned as turners. The Marquis of Lorne is a grocer, and the Lord Mayor a farrier. The Right Hon. Sir Richard Baginbald and Sir Moses Montefiore are merchant tailors. The Solicitor General (Sir Hardinge S. Gifford) and Mr. Sergeant Robinson are saddlers. The Right Hon. Lord John Manners and J. D. Samuda, M. P., are shipwrights. Sir T. G. A. Parkyn is a cook, and the Rev. Apsley Chase Ranger a pewterer. Lieutenant Colonel Robertson is a blacksmith, and Sir R. Wallace, Colonel Wilmott, V. C., and Colonel Dyott, coachmakers. Captain Pim, R. N., is a needlemaker, and the rector of Grays (Essex) a vintner. Sir Edward Watkin is a wheelwright, and the Right Hon. A. Smee Ayrton a leather seller. Mr. W. T. Charley, M. P., is a joiner, and Sir Garnet Wolseley a clothworker. The clockmakers claim four M. P.'s in Mr. Bousfield, Mr. Cobbold, Mr. Isaac, and Mr. Sanderson; and Aldermen Cotton, Stone, and Sir Francis Truscott, and the Hon. J. G. Francis represent the haberdashers; Sir Stafford Northcote, Sir Michael Hicks Beach, Rear Admiral Sir John C. D. Hay, the Right Hon. J. R. Mowbray, Mr. H. C. Raikes, Mr. C. W. W. Wynne, and the late Mr. Ward Hunt appear as felt makers, while the spectacle makers claim the Right Hon. G. J. Goschen, Sir William Hart Dyke, Sir Thomas Chambers, Mr. J. T. A. Gardner, Sir A. Lusk, Mr. William McArthur, Mr. C. N. Newdegate,



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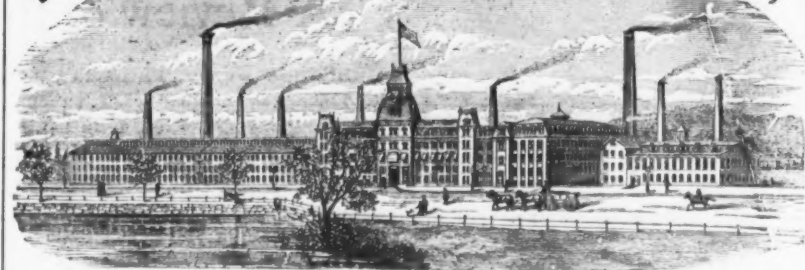
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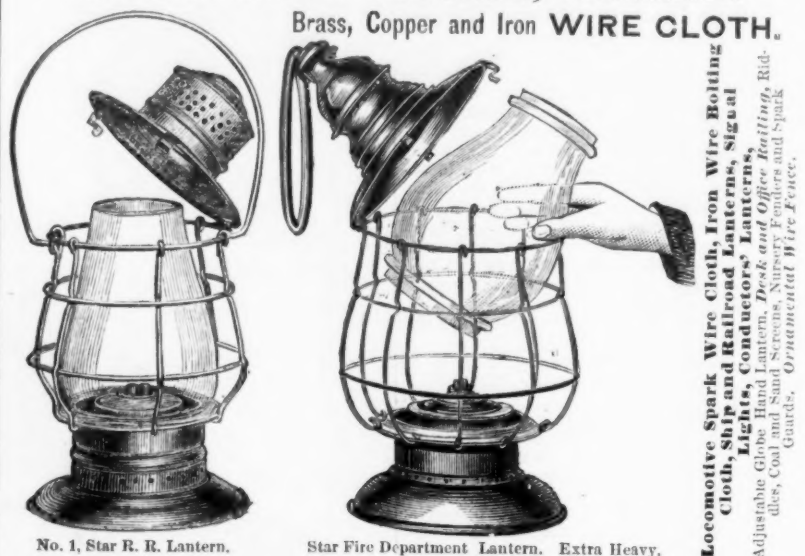
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corrections. Plenty of space for cost and selling  
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pages ruled to match the rest of the book for new  
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ner. Adapted to the wants of either the wholesale  
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long, inside, thus occupying hardly more room  
than tin plate, and securing lowest rates of freight.  
Entirely made by machinery, every joint is exactly  
alike, and fits together with the greatest accuracy  
and ease. A child can adjust it, no tools being re-  
quired. When put together it forms the strongest  
and most perfect pipe in the world. Over each of  
the rolls is drawn one joint of pipe to protect the  
others from dirt and moisture, thus keeping it in  
perfect condition always. The following are net  
cash prices, viz: 5 in. per joint, 12c.; 6 in. per joint,  
13c. Other sizes in proportion, and made to order  
when desired. Packed 50 joints in a crate, for  
which no charge is made.

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For Edge and Turning Tools, Taps, Dies, Drills, Punches, Shear-Knives,  
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**SAW PLATES**  
For Circular, Mulay, Mill, Gang, Drag, Pit and Cross-Cut Saws.  
**Sheet Steel**  
For Springs, Billet Web and Hand Saws, Shovels, Cotton Gin Saws,  
Stamping Cold, &c., &c.  
**SIEMENS-MARTIN (Open-Hearth) PLATE STEEL**  
For Boilers, Fire-Boxes, Smoke Stacks, Tanks, &c.  
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Cast and German Spring and Plow Steel.  
"Iron Center" Cast Plow Steel, Finished Rolling Plow Counters with Patent Screw  
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"Solid Soft Center" Cast Plow Steel, Agricultural Steel cut to any pattern desired.  
Steel Forgings made to order.

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MICA TO ORDER IN ANY PATTERN.  
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No. 120, Fore Plane 120 inches in length, 2 1/4 inch Cutter, \$2.25.

**New Patents.**  
We take the following abstract of new  
patents, recently issued, from the official  
record:

**ELASTIC WHEEL TIRE.**  
To F. Mullier, Liverpool, England.—Aug.  
7.—1. As a new article of manufacture, a  
molded vulcanized India  
rubber tire C, provided  
with lateral flanges a a at  
its base, and lateral re-  
cesses b b outside or above  
said lateral flanges for the  
reception of lateral gripping  
surfaces.

2. In combination with the ordinary tire  
B and rim of the wheel, the flanged elastic  
tire C, gripping surfaces D, and fastening  
device E.

193,607.—Die for Welding Links.—J. H.  
Helm, Allegheny, Pa.—July 31.  
The inclined planes of the die blocks and  
the cavities therein operate so as to concen-  
trate the force of the movable die block upon  
the portion of the link to be welded, and  
they are so constructed that the inner line of  
parting of the die proper dips below, and the  
outer line rises above, their respective planes  
throughout the portions that embrace the  
sides of the link.

193,617.—Feed Water Heater and Pump  
Combined.—Delos E. Rice, Detroit, Mich.  
—July 31.  
The feed water heater consists of a cylin-  
dric tank, a submerged reciprocating pump,  
exhaust steam inlet pipe, feed water inlet  
pipe, having its end covered by a perforated  
plate, and in line with the steam inlet pipe,  
steam escape and overflow.

193,643.—Machine for Making Bolts.—Geo.  
Dunham, Unionville, Conn.—July 31.  
The feed rolls and the die rolls oscillate,  
and the latter are provided with gripping and  
angular shaping die surfaces, and carry  
shears. The heated bar is fed to the gripping  
surfaces of the die rolls and held, when it is  
seized by the upsetting jaws and upset, to  
provide metal for the square neck. The feed  
rolls again oscillate, thrusting the rod  
forward between the angular shaping sur-  
faces of the rolls, which reciprocate toward  
the feed rolls, to enable that to be done.  
The preliminary shaping having been done,  
and the end of the rod having been seized  
by the transferring tongs, the blank is se-  
vered and carried to the holding and turning  
jaws, which receive and hold, while the  
heading and squaring dies do their work,  
and turn between the two strokes of the  
squaring dies.

193,715.—Machine for Grinding Calendar  
Rolls.—E. E. Latham and R. Binns, South  
Windham, Conn.—July 31.  
By key, cams or screws bends the rails  
and ways of the upper carriage to correct  
irregularities in the ways. On one end of  
the carriage is a sliding shoe, in which one-  
way groove is cut. May reverse carriage  
and straighten again. May use indicator to  
multiply deviations.

193,926.—Nail Plate Feeding Machine.—E.  
J. Couch, Allegheny, Pa.—Aug. 7.  
The double cam groove formed by the  
double ring secures, through the sector and  
its wrist, the advance of the nail plate at  
each half revolution of the tubular barrel.

193,963.—Machine for Sawing Metal Bars.—  
Wm. R. Jones, Braddock's, Pa.—Aug. 7.  
The end of the rail adjacent to the saw is  
securely clamped by a vise while being op-  
erated upon. In line with the plain roller,  
over which the rail passes, and the vise are  
a series of jacks (against one of which the  
back of the rail is pushed), the square faces  
of which serve as gauges to determine the  
length of rail end to be cut off. The journal  
boxes of the saw-arbor are balanced by a  
weight and system of connecting levers.

193,973.—Time Lock.—Lewis Lillie, Eliza-  
beth, N. J.—Aug. 7.  
A supplemental unlocking mechanism is  
provided, whereby the lock can be unlocked  
in case time mechanism should stop.

194,008.—Device for Opening and Closing  
Doors of Furnaces, &c.—Henry A. Stad-  
ler, New York, N. Y.—Aug. 7.  
A stepped or notched rod or bar is freely  
connected by an eyebolt to the furnace door,  
and engages with a fixed guard or rail  
arranged to support said rod or bar.

7834.—Machine for Forming Flanges on  
Boiler Heads.—R. C. Nugent, Dayton,  
Ohio, assignor, by mesne assignments, to  
Phillips, Nimick & Co., Pittsburgh, Pa.—  
Patent No. 166,715, dated Aug. 17, 1875.  
—Aug. 7.  
The pivoted table upon which the plate to  
be flanged is held by a pin passing through a  
center hole is made concave. The frame  
carrying the pivoted plate is raised by means  
of worm-shafts and segmental rack to bend  
and form the flange, the edge of the plate  
being grasped between the rollers and re-  
voluted thereby.

**The Romance of the Eddystone  
Lighthouse.**  
For more than a hundred years one of the  
most interesting and conspicuous objects to  
the voyager bound up the English Channel  
has been the famous lighthouse built by John  
Smeaton, on the Eddystone rocks. Lifting  
its gray mass above the turbulent sea near  
the entrance to Plymouth Sound, it has stood  
for a century in the pathway of the world's  
commerce, a monument of human genius  
and patience, a boast of man's superiority  
over the forces of nature. But nature has  
conquered at last. The Eddystone Light-  
house, so long regarded as one of the grand-  
est triumphs of engineering, must come down.  
At the recent meeting of the British Associa-  
tion for the Advancement of Science, Mr. J.  
N. Douglass, Engineer to Trinity House,  
read a paper explaining the necessity for  
the demolition of this extraordinary work.  
The waves have beaten in vain against  
Smeaton's masonry, but they have actually  
undermined the rock upon which it stands.  
Based "on the solid rock" is no longer an  
expression of fact.

The Eddystone Rocks, lying in one of the  
most frequented parts of the Channel, and  
entirely covered at high water, were long  
ago regarded among the principal dangers of  
the English coast. The difficulty of erecting  
a light upon them was only overcome after  
various trials and disasters. It is impossible  
to approach the spot except in the most favor-

able weather, and at certain times of the  
tide, and owing to the exposed situation,  
near the entrance of the Channel, in the full  
sweep of the Atlantic gales, the sea often  
rises here to extreme fury, and the waves  
dash over the lantern at the height of 85  
feet. On several occasions they have broken  
the glass. The first lighthouse on the Eddy-  
stones was begun by Henry Winstanley in  
1696, and finished in 1699. It was a sort of  
wooden pagoda, on a stone base. It stood  
only four years, being swept away by a  
storm in 1703, and the builder and several  
workmen who had gone off to it for the pur-  
pose of making some repairs, perished at the  
same time. No trace of the men was ever  
found, and not a fragment of the building  
remained, except a few scraps of iron. But  
Winstanley had demonstrated that a light-  
house could be built on this fearful ledge,  
and Rudyerd accordingly, who was not a  
professional engineer, but a silk mercer,  
completed another, an ingenious structure  
of wood and iron, in 1709. The wood seems  
not to have answered very well, but the  
building lasted until 1755, when it took fire  
one December night in the lantern, and the  
keepers were driven from room to room till  
they reached the rock, whence (the weather  
being fortunately calm) they were taken off  
the next day.

Smeaton's great work, which has since  
served as a type and model for the finest  
lighthouses in the world, was begun in 1756  
and finished in 1759. He secured a magnifi-  
cent foundation by leveling off the gneiss  
rock in horizontal steps, so that every course  
of masonry might rest upon a true horizontal  
bed; and to protect the ground joints still  
more completely from the action of the sea,  
he caused the lower courses to be sunk at  
least 3 inches in the solid rock, as in a socket.  
All this cutting of the foundation was done  
with chisel and hammer, best blasting should  
loosen the rock. The materials used in the  
building were Portland stone and granite,  
laid in hydraulic cement. The blocks were  
a ton and two tons in weight, and carefully  
dovetailed together, every course being  
adjusted on a wooden platform before the  
stones were carried to the rock. The courses  
were furthermore connected by stone dow-  
els, and the whole firmly clamped. To find  
the best and strongest shape for the edifice  
which had to be built upon this foundation,  
Smeaton applied to nature. He imitated the  
trunk of a tree. The lighthouse tapers grace-  
fully to the top, with a slightly concave out-  
line, and its base spreads outward as if it  
were rooted in the rock. The upper part  
was originally of wood, but being burned in  
1770 it was rebuilt of stone.

The enormous difficulties encountered in  
the execution of this work, the ingenuity  
and perseverance displayed in overcoming  
them, and the full particulars of the plan—  
one of the most skillful combinations of ele-  
ments of stability ever devised—are well  
described in Smeaton's "Narrative;" and in  
spite of the progress that has since been  
made in mechanics, the Eddystone Light-  
house has never ceased to be the pride of  
every Englishman and one of the marvels  
of engineering. If it now must be de-  
stroyed, the nation will have the consolation  
of knowing that a better building can be  
erected in its place. Although the sea beats  
in vain against its walls, it cannot be  
regarded any longer as a lighthouse of the  
first rank. There are some modern improve-  
ments which cannot be applied to it. Science  
has discovered how to throw a light so far  
that a building of considerably greater height  
than this is now required to give the proper  
range. A fog signal of the largest kind  
seems also to be needed in this position, and  
Smeaton's structure is too confined to hold  
it. But it is proposed, when the tower is  
destroyed, to put the stones together again  
and leave them as a monument on the coast.  
It would be an excellent thing to do. The  
model lighthouse should stand there, as a  
memorial of a great engineer and an im-  
pressive reminder of the weakness and little-  
ness of man when he battles with the ele-  
ments.

**Alchemical Recipes.**—In their search  
for the philosopher's stone the old alchemists  
left no mixture of familiar or unfamiliar  
ingredients untried. In an ancient work  
called "The Gold Maker's Guide" we have  
this promising formula: "Take of the gall  
of a black tomcat, killed when the night  
approacheth, one part; of the brains of a  
night owl, taken from out its head when the  
morning dawneth, five parts; mix in the  
hoof of an ass when the tide turneth; leave  
it until it doth breed maggots; place it on  
thy breastbone when the moon shineth  
bright—and thou wilt see a sight which the  
eye of mortal man ne'er beheld afore." If  
experiments with this recipe tended to  
make the nocturnal melody of the "black  
tomcat" less frequent in the land, the  
author of the "Guide" deserved so far the  
gratitude of his generation. Another formula  
reads thus: "Hide and couple in a trans-  
parent denne, the Eagle and the Lyon, shut  
the doore close so that their breath go not  
out, and strange ayre enter not in; at their  
meeting the eagle will tear in pieces and  
devoure the lyon, and then be taken with a  
long sleepe." The explanation of such rid-  
dles is simple enough when we have the key.  
The "transparent denne" is a glass vessel;  
gold foil is typified by "the lion." Now  
cast in "the eagle"—that is, a little mer-  
cury. This quickly forms an amalgam with  
the gold and becomes a sluggish or pasty  
mass, or "is taken with a long sleepe."

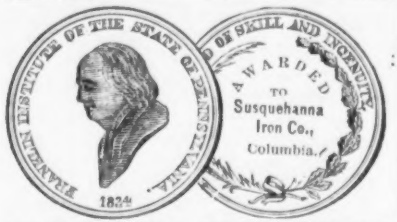
There is a new anæsthetic. Prof. McKen-  
drick and Dr. Ramsay have been experi-  
menting in England with substitution pro-  
ducts obtained with pyridine and chinoline.  
The latter of these bases is extracted from  
quinine by means of caustic potash, but may  
also be procured by some of the coal-tar  
series of substitutions. Three grains of the  
chloride of chinoline introduced into the  
circulation of a rabbit, rendered the animal  
unconscious in eight minutes, but the pulsa-  
tion of the heart continued and the breath-  
ing was vigorous. The rabbit recovered  
after two or three hours, and the experiment  
is deemed highly successful. Some of the  
other derivatives from these bases proved to  
be very powerful poisons, having specific  
action upon the vital centers, and likely to  
be of use in the materia medica.







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Corner South & Penn Streets, Phila.  
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Shafting & Pulleys, Steam Engines,  
Pumps & Rollers, Copper, Brass,  
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curved to template, largely used in the construction of Iron Vessels.

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**The Anvil Brand**  
**REFINED IRON.**  
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Rounds, Squares and Flat Bars, Bands,  
Skelps, Hoop and Horse Shoe Iron, Ovals,  
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Iron. An assortment of sizes constantly in  
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Steels finished and tempered by NELLIS' PROCESS  
to suit any kind of soil. Special attention given to the  
manufacture of Nellis' Original Harpoon Horse Hay  
Fork Grapple and Wood Wheel Wrought Frame Horse  
Fork Pulleys. 27 Medal awards on all goods of our  
manufacture exhibited at the Centennial.

### Hydraulic Engineering in Colorado.

Nearly one-half of the world requires irrigation for growing crops. In one-half the territory of the United States it is also required. Irrigation has been practiced in New Mexico for more than 200 years, and it is well established in Colorado, Montana, Idaho, Utah, Arizona and Nevada, as well as in much of California. Many rules and regulations are required, because the supply of water is always in excess of the amount of land sought to be cultivated.

In all old world countries weak farmers suffer. Even in Damascus, where "every drop of water runs by law," Christians are not allowed as much water as Mohammedans. The complaint is of "water being shut off above," and this, in hot, dry weather, is fatal to vegetation. In old Mexico are to be seen the ruins of cities that once were flourishing, and they met their doom because other cities were established above, taking off the water.

The effect of depriving a town or farming community of water is comparable to that produced by an earthquake or plague. Every earthly prospect darkens, all kinds of business end, famine and death approach. In Italy and India government regulates the supply, but great difficulties exist upon final distribution. In no country has the system been so thoroughly studied and wisely managed as in Colorado, by improving upon old Moorish laws. Two principles have been added to the fundamental law of the new State constitution, which are, first, "The water of streams belongs to the people," and second, "Priority of appropriation gives priority of right." This last provision happily and forever settles the right to water of those who come first, build cities and towns, and make rural homes.

The average cost of getting out water is \$10 an acre. Where an isolated farmer has command of a small stream coming directly from the mountains, the cost is much less. Where water is brought in long canals and over a rough country, and where dyking is required, the cost is much greater. In the vicinity of Ogden, Utah, is a plateau of several hundred acres now covered with orchards, and the cost of bringing water to it, across a valley, was over \$150 an acre. The land now sells for \$1,000 an acre. Almost always the canals or ditches that are to supply a number of farms are built by corporate companies, which sell the water to the farmers for about \$1.50 an acre per annum, and it is calculated that an inch of water delivered at 5 inches pressure, to run through the whole season, night and day, will be sufficient for one acre. In cities and towns the rate is from \$1 to \$5, and even \$10 a lot; in suburbs, from \$5 to \$10 an acre. These rates are always cheerfully paid, for the yield of crops is double, at least, to that where the dependence is on rainfall. It is seldom that water companies make much money.

At Greeley, Col., a new system has been established; probably it has become a nearly perfect as possible. First, the land of the colony was bought at wholesale and given to the members of the colony at cost. At the same time two large irrigating canals were dug with a common fund, and the use of the water was attached to the land in perpetuity, so that water is as much a part of an 80 or 160 acre farm as the foundation rocks. The cost of the land and the water has been, altogether, about \$13 an acre. An annual tax is laid for superintendence and repairs of about 25 cents an acre. This is for farming land. For town and suburban land it is \$1 for a lot and \$1 an acre. When enlargements of the canals are made, assessments are apportioned, and the work is done by the farmers themselves. Another provision is to be noted that is decidedly peculiar. While water in this community is attached to the realty, a farmer may sell his water to another farmer for one year only, or several farmers may unite to exchange water—as, for instance, three farmers uniting with each other for three days in the week have three times the amount of water that each would be entitled to during six days. A large volume is thus obtained and irrigation is done most expeditiously; and as grain fields require water no oftener than once in two or three weeks, the advantages of this exchange are great.

The question of equally dividing the water was a problem that presented itself to the Greeley settlers during the first year, and so pressing was the required solution that the success of the settlement as a whole depended upon it, for when the farmers along the upper line of the canal, which is thirty-five miles long, were permitted to draw water as they pleased, those along the lower line got none, and those immediately had an interrupted supply. The difficulty lay not so much in a short supply as in a want of proper distribution, and particularly in waste. The sense of justice in the majority of men who are unrestrained by law is not on the average high. In addition to the necessity for dividing water equitably at the flumes of the great canals, it was also necessary that it should be divided equally among farmers along the lines of main laterals, some of which are three and four miles long, while there are sub-laterals going to remote farms. One will at once see the difficulties presented, and also readily understand why disturbances arise in Oriental countries. Now, one of the leading farmers, who by the way is a literary man also, devised a method which has forever solved this vexed problem, and so great is the satisfaction given that it is being rapidly adopted elsewhere.

The device consists of a flume 12 feet long, 10 to 30 inches broad and 5 feet high, set at the bottom of the embankment and so receiving water from the bottom of the canal. At the upper end is a gate which during the season is partly open, and at the lower end or land side is another gate, which opens horizontally. The water comes into the flume and there stands at a dead level. Now the number of acres requiring water for the season is definitely ascertained in the spring, and the carrying capacity of the canal being known, a dividend is struck, giving an equal definite amount for each acre. Upon a fixed bar, close to the lower gate, slots, checks or figures are made, indicating 20, 40 or 80 acres, and when the horizontal gate is opened it is set so as to correspond with the figures on the bar, and the water flows for the required acres; and as it comes from dead or still water, in all the flumes with an

equal pressure, the amount delivered from each flume, say for 80 acres, is equal, each to each, as has been demonstrated both by measuring and weighing. It appears to be the case that as mankind moves westward many old and false ideas disappear, and new ones are adopted, untrammelled by traditions and long-established customs.

Irrigation is always a necessity where the general elevation is several thousand feet above the sea level, or where mountain ranges run across the sky so as to arrest the fall of moisture, and in each case the water used for irrigation first falls upon the mountains. Except in Africa, irrigation is almost always practiced in sight of mountains perpetually covered with snow. The general elevation of the plains of New Mexico is 6000 feet; of Colorado, 5000; of Montana and Idaho, 3500; of Utah, 5000; of Nevada, 4500; of the plateaus around Jerusalem in Palestine, 3000. The average amount of rainfall in the countries of the higher elevation is about 12 inches per annum; in those of the lower, 16 to 18 inches, and in these last wheat and other small grains can be grown without irrigation, providing there are winter or "latter rains," as in California and Palestine, but gardens or vegetable crops must be irrigated; also vines and fruit trees in the earlier stages of their growth. The annual rainfall of the Atlantic States is about 50 inches; of England, 55 inches. An acre of wheat requires for its maturity a depth of 10 to 12 inches of water, in the aggregate, all over the surface. This is equal to the supply on the great interior plains, but there it comes at such irregular intervals that no dependence is placed upon it except for germinating the seed of small grain, which almost always is sown early in spring, so as to receive the benefit of the last snows. Should snow or rain fall the grain must be started by irrigation, which is always dreaded, because a bare surface bakes and becomes hard, though something depends on the nature of the soil, whether sandy or adobe.

In preparing for irrigation two things are about equally necessary, one, a sure water supply, the other, land so situated that water can be brought upon it without too great an outlay. A preliminary line is to be run, and a surveyor is employed, who, selecting a suitable locality on a stream where a dam can be built, and where the banks are low, will, by help of an assistant, mark out a line, indicated by stakes driven two or three rods apart. A proper stream should have a fall of about ten feet to the mile, and the fall of an irrigating canal should be from three to five feet to the mile. When the line has been run it is safe to reverse the work so as to correct mistakes. Thousands upon thousands of dollars have been lost for want of this precaution, for mistakes have been made, and when the excavation has been completed there is no possibility of correcting the error. The real work commences by ploughing a furrow from stake to stake; what is called a farm ditch to supply two or three farms can be mostly finished with the plow. Two furrows will make a ditch large enough to carry water for 15 or 20 acres. A larger one, called a canal, is made with plows, scrapers and shovels. The contract price of excavation is about 18 cents a cubic yard, so that the cost will be from \$300 to \$1500 a mile.

By far the larger amount of water used is for wheat, oats and barley. Where due regard has previously been paid to selecting land, as was the case in Greeley, a vast area will be presented every way suited for being irrigated, and when the grain is well above the ground continuous fields extend along the line of the canal as far as the eye can reach, usually without any intervening or division fences, for one common fence incloses the whole domain, while on the borders appears the brown and everlasting desert; and far away the snowy mountains, 12,000 to 14,000 feet high. The average yield of wheat is 25 bushels to the acre. Manifestly the need for water is greatest when the weather is hottest, at which time the snow melts fastest. Then the snow water rushes through morasses and rocks and dense, dark forests, bearing along elements of fertility which are carried forward to the grain fields and there deposited. In New Mexico the fertility of soil has been maintained for six generations of the most slovenly farmers. In all the little farm and garden ditches a dark deposit of rich loam two inches thick appears at the end of the season, and the chief use of manure is to give to the mineral manures washed out of the rocks what is an equivalent to vegetable mold.

A grain field is irrigated three times; the first time after the ground is fairly covered with the growing crop; the last time just before ripening, and each time the ground is submerged, every inch being reached by the water. Except in porous soils, water will not soak more than 12 inches. The farmer who invented the dividing flume has so arranged the furrows running through his fields that he has turned on the water at sundown, and returned at an early hour in the morning, finding 50 acres completely covered.

Plows of a particular structure have been invented for making two furrows at a time for irrigating corn, and a vast amount of work is thus saved, while their execution is marvellously exact; water is let into corn by every other row, so that each row gets moisture, but this grain is never watered while young, lest it should be turned yellow and be dwarfed; but late in the season it is wetted abundantly. Potatoes are easily ruined by water, and many large fields have been destroyed by being drenched. Three irrigations are sufficient, a lively stream being turned between the rows, but the greatest care is taken that the water be stopped off so soon as it reaches the further end of the row, for the ground needs to be moistened, not soaked.

Gardens and lawns are watered every week, and so treated that clover and all the grasses grow most luxuriantly, giving two and three heavy crops in a season. Cucumbers, melons and all vines need water often—the first may be drenched every evening. In short, most vegetables take water well every few days; but unless the ground has a chance to get dry, so that cultivation may be done, it bakes almost solid, and growth is suspended. Flowers are especially benefited by frequent irrigation, and in the light of

that brilliant sun, shining unclouded 300 days in a year, they take on colors of a brilliancy elsewhere unknown. Beets and turnips grow to astonishing size, and the writer once raised half an acre of cabbage the average weight of the heads being 20 pounds, and it was impossible to place the full-sized head inverted into the largest size wash-tub. It is not uncommon to raise specimens of cabbage weighing from 50 to 80 pounds each. Of course the soil is highly fertile, the cultivation is thorough, and water and brilliant sunshine do the rest. It is impossible to conceive of a more charming rural home sight than that which an acre or so of garden lawn and flowers presents in the summer morning after water has been allowed to run all night and then turned off, for all the leaves are covered with dew; moisture and fragrance fill the air, and birds, having come from afar, sing in the trees. Perhaps much of that which charms arises from contrast, for it will have been weeks or months since a drop of rain has fallen; the waysides are brown and sore, and the sky is the same as that over "the weary land" where the shadow of a rock is sought with eagerness.

Over the western half of our country no question has anything of equal importance with that of water supply. For several years the Union Pacific Railroad ran a water train nearly 100 miles through the Bitter Creek country, at an annual cost of \$50,000, for supplying their locomotives. At last they sank five or six artesian wells, each about 1000 feet deep, and at a cost for each of something like \$15,000. Most of them flowed from the top; in the rest water came within ten or fifteen feet of the surface. After a year or so some of the flowing ones stopped; perhaps two still run. If all the water of a flowing well were saved, it would irrigate about two square miles of land, equal to 1240 acres. The United States Government spent \$10,000 on a well at Fort D. A. Russell, Wyoming, when it was found that the boring was in an old gulch filled with drift, and work was abandoned at about 1100 feet. At Denver a well was sunk 500 feet, the water rose within 50 feet of the surface, the tackling broke, and work has never been resumed. The Kansas Pacific Railroad has spent in the same way a good deal of money, and lost it.

A few years ago General Grant recommended that Congress should donate a large body of land to Colorado, on condition that a canal should be taken out of the South Platte river, to be extended to the Missouri, by which 20,000,000 of acres were to be irrigated. A more visionary scheme never was conceived, and it was quietly dropped. It is a wild estimate to say that of the 66,000,000 of acres in Colorado, its rivers will be able to irrigate 6,000,000; probably 3,000,000 would be nearer the truth. New Mexico can water no more; the streams of Wyoming will water about the same, and those of Montana at least twice as much. But it must be understood that during any given series of years an acre of irrigated land will produce immensely more than an acre where rain is depended upon—so that population will become dense in all these far-off valleys. It should be noted that the surface of all these plains is covered with nutritious grass, capable of sustaining vast numbers of sheep, horses and cattle, while the feed is as good in winter as in summer.

The rainfall of China, east of its mountain range, is probably about the same as in the Atlantic States, and yet irrigation has been established there for thousands of years. It has long been the practice to irrigate meadows in England, and two years ago, during their distressingly dry summer, many attempts to irrigate were made, and many schemes were projected. Some rich proprietors laid iron pipes just below the surface of meadows, so constructed that water burst up and fell in artificial rain. Such a device is both useless and absurd, because the object sought is better attained by bringing water in ditches to the higher parts of a field, and then letting it flow over every part. One might think such ditches would disfigure the surface, but such is far from being the case, as the grass quickly clothes them. Even in plowed fields irrigating ditches form no kind of obstacle, and the grain quickly closes over them. A plow furrow run through thickly standing grain, as is often done, does no damage, for the roots quickly tiller, and new stalks fill the gap.

Farmers and country gentlemen could often irrigate their gardens and meadows to great advantage. A spring brook might be made to fill a reservoir holding a quarter of an acre, which would irrigate two or more acres of land. But of course water will not run up hill. A fall of 5 feet to the mile would be sufficient, only a large canal should have a slight fall if it is to carry a heavy volume. On a rapid stream the best dam for turning water into a ditch is made of brush and gravel. The Mormons spent over \$10,000 in damming the Jordan a few miles from Salt Lake City, and the dam has been carried away. In parts of Ohio and Illinois artesian wells are had by boring from 40 to 60 feet, and there irrigation should be easy. Perhaps water will, some day, be taken out of Niagara River above the Falls to water a region along the Southern shore of Lake Ontario.

In the Sacramento Valley a great many windmills, each costing but a small sum, are used for raising water from a depth of 12 feet to irrigate market gardens. One mill will water about half an acre. In India, tanks for storing water are common, and they are of vast service. The ancient Jews built them, and pools likewise. On many farms reservoirs could be made at small expense by building a dam across a gulch to hold the water between it and the hills. By such means the hay crop could be vastly increased, our gardens, fruit orchards and strawberry beds could be made to double their average yield, since vegetation need never receive a check. Whatever plan may be adopted you need not feel afraid of getting more water than you want. The chances are you will not get enough. You will quickly get a realizing sense of how much water plants need in dry weather by carrying it in pails. Should you pump from a well directly into a furrow you will find that constant work for two hours will be required to make the water run 50 feet along the dusty channel. A suitably sized stream from a fountain head will run down and away almost like a stream of light.



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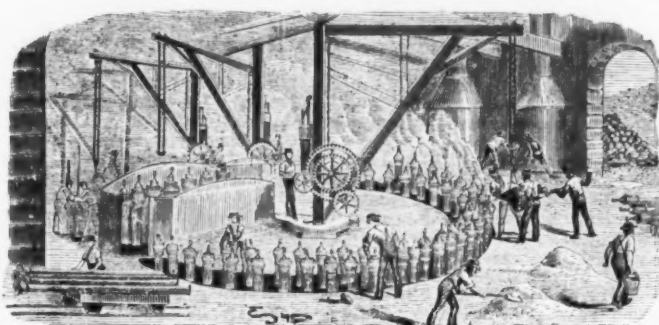
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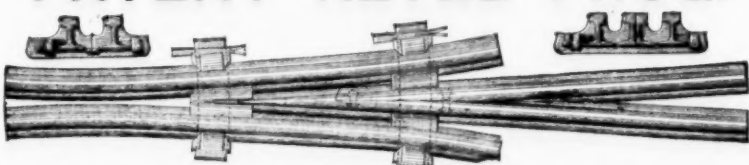
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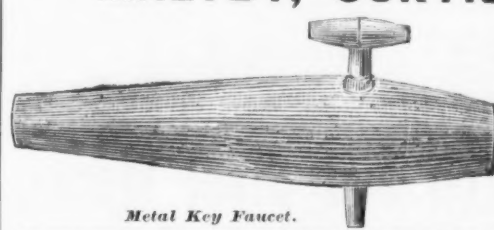
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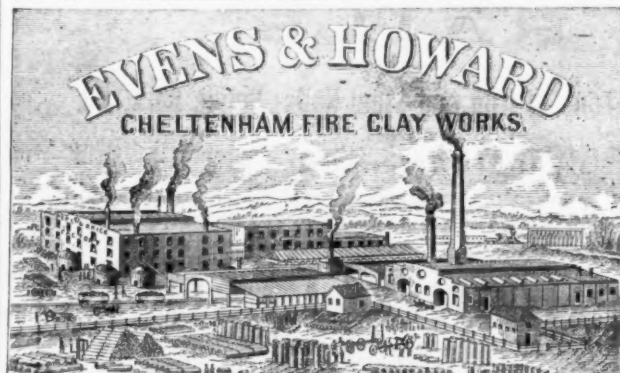
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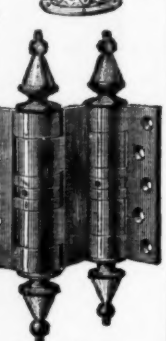
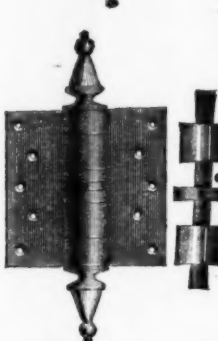
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- 1st. For their Protected Bearings (the Howe is the only Scale with protected bearings), which makes the Scale DURABLY ACCURATE.
- 2d. For their Strength.
- 3d. For their Simplicity.
- 4th. For their economy in construction.
- 5th. For their first rate material and workmanship.
- 6th. For their various original improvements and adaptations (which being patented are exclusively possessed by the HOWE).

## The Improved Howe Scales

MADE BY THE

## BRANDON MFG. COMPANY, of Brandon, Vt.,

Are Guaranteed Superior to all others.

For Plans, Prices and other information, address,

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cinnati. 612 N. Third St., St. Louis.

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## The Best Wagon Spring in the Market for Farm Wagons, Lumber Wagons,

And all other wagons having bolsters and standards.

The Springs are not fastened to the bed. The pockets or  
cups in which are placed the coil springs are made of  
wrought, malleable or cast iron, two of which, with the iron  
connecting them, forming a saddle made in one piece, to  
straddle the end of the bolster or 6 inches from the stand-  
ards, as in the cut, there being under the bed four of these  
saddles, with 8 pockets and 8 springs. These saddles being hung on  
the bolsters can be easily taken off, by  
simply lifting the wagon bed; or the springs can be made of  
different weights, running from one to ten thousand pounds, simply  
by having lighter or heavier steel coil  
springs. A wagon will last longer and pull easier with Springs than  
without them, and avoids the constant  
pounding and jarring on the bed, spindle and wheels. These Springs  
are cheap and durable. Any person  
can put them on. A wagon will carry a heavy or light load with  
one set of Springs, by removing one-half of  
the Springs from the pockets.

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mail. Send for price list and circulars. Address

## THE LAFAYETTE WAGON SPRING COMPANY,

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## The Largest Pump Works in the World.

Over 800 Different Styles.  
PUMPS, STEAM PUMPS, ROTARY  
PUMPS, CENTRIFUGAL PUMPS,  
PISTON PUMPS,  
for Tanners, Paper Mills, Fire Purposes, suitable for all  
situations imaginable.



## Also, HAND FIRE ENGINES.

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## W. S. BLUNT'S

Universal Force Pumps.

Secured by Letters Patent.

These Pumps have enormous  
power, and are for the  
house or for out-door wells of  
any depth. They are con-  
structed with special regard  
to strength, ease of working  
and durability. They can be  
immediately changed from  
lift to force pump, and the  
air chamber can be revolved,  
so as to allow the handle to  
work at any desired angle  
with the pump. Having close  
tops, they cannot be tam-  
pered with. Attention is  
called to our new elegant  
pattern Deep Well Non-  
Freezing Fire Pump.  
Also, Blunt's Sand Vacu-  
um Chambers—a com-  
plete protection against sand  
or gritty water in clay or  
driven wells, pits, mines and  
rivers. For hand or steam  
pumps, all sizes, from 1 1/2  
inch to 4 inch suction pipe.  
Send for circulars to  
NASON MFG. CO.,  
71 Fulton and 71 Beekman  
St., New York.  
Western Agency—Newton  
& Hale, Chicago.  
Sole Coast Agency—Dun-  
ham, Carrigan & Co., San  
Francisco, Cal.

## The Oldest Shot Tower in America.

\* FOUNDED JULY 4, 1808.



## THOMAS W. SPARKS,

Manufacturer of

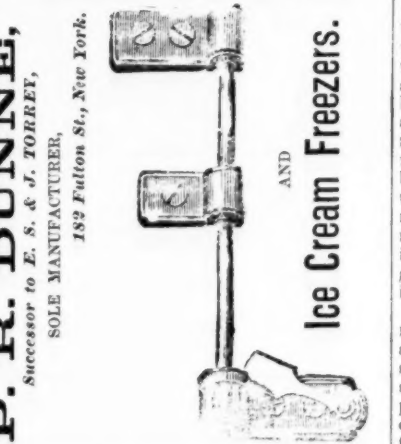
## American Standard Drop and Buck Shot and Bar Lead.

121 Walnut Street, Philadelphia.

Premium awarded by the Judges of the Centennial  
International Exposition for uniformity and general  
good finish of Pellets.

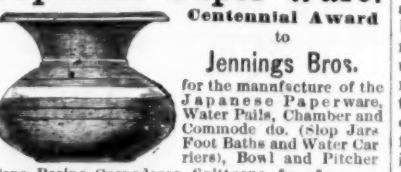
## "TORREY'S DOOR SPRINGS"

These are chiefly steam packing in the  
rope or loose form for piston and pump rods,  
and stuffing boxes, and mill-boards for  
steam joints, gaskets, man-hole plates and a  
species of felting to cover boilers and steam  
pipes. The ability of asbestos to resist an  
elevated temperature, moisture, friction and  
flame itself, joined to its lubricating quality,  
specially recommends it for the above pur-  
poses. The chief objection of the manufac-  
turer is that when properly prepared and  
applied it lasts too long. As covering for  
boilers and pipes, it saves 25 per cent. or  
more of the waste heat; and in domestic  
uses in cellars, to prevent loss of heat by  
radiation, it is found to reduce the tempera-  
ture of the cellar 15 deg., while raising that  
of the house above to deg., i. e., it saves the  
furnace or steam heat, and sends it where it  
is most wanted.



## Japanese Paper Ware.

Centennial Award



Jennings Bros.  
for the manufacture of the  
Japanese Paperware, Water  
Pails, Chamber and  
Commode do, (Slop jars,  
Foot Baths and Water Car-  
riers), Bowl and Pitcher

Pans, Basins, Cuspadores, Spittoons, &c., &c.  
Warehouse, 373 Pearl St., N. Y. City.  
Trade supplied.

## Alabama Coke Manufactured at Pitts-

burgh.

We have been shown a very handsome  
sample of coke manufactured from Alabama  
coal by Mr. S. Stutz, Mining Engineer, of Pitts-  
burgh. Some months ago Mr. J. T. Milner,  
superintendent of the Newcastle Coal and  
Iron Company, of Newcastle, Alabama, was  
at Pittsburgh to witness the operation of Mr.  
Stutz's new coal-washing machine, at the  
works of John Robison & Son, Fourteenth  
Ward, and after his return sent half a ton of  
their coal to be washed and coked. The coal  
was taken from the Milner seam, which  
has a thickness of from 5 to 7 feet clean coal.  
It is a very good bituminous black coal, with  
cubical cleavages, dull vitreous luster, and  
very similar to Connellsville coal.

An analysis made some time ago by Prof.  
Wuth, gives the following results:

Specific gravity.....	1.36
Water.....	0.36
Volatile matter.....	27.93
Fixed carbon.....	59.69
Ash.....	10.92
Sulphur.....	0.54

As can be seen from the above analysis,  
the amount of sulphur is very small, while  
the high percentage of ash being due to the  
presence of a great quantity of shales and  
thin pieces of slate mixed with the coal,  
will require a separation of the carbon from  
the impurities. This has been accomplished  
by the washing machinery in the most per-  
fect manner in presence of Mr. J. W. Bell,  
of Porter, Bell & Co., locomotive builders,  
representing the Newcastle Coal and Iron  
Company. The whole material having been  
crushed to very small pieces previous to its  
introduction into the washing box, the fine  
grains of coal came out of the machine  
entirely free from slate and sulphur, and the  
samples of coke manufactured from it are  
not surpassed by the best Connellsville. It  
is a very strong and hard coke, presenting an  
open cellular structure and will, no doubt,  
be well adapted for the use of blast furnaces.  
Mr. Stutz has also washed and coked many  
other kinds of coal for different companies,  
some of which contained as much as 6 per  
cent. of sulphur, and succeeded well in the  
separation of the carbon from the impurities,  
and in the manufacture of coke.

## Asbestos and its Uses.

Recently the subject of asbestos has  
attracted considerable attention, and Iron  
has collected considerable interesting infor-  
mation concerning it:

It is only quite recently that this sub-  
stance has risen from being simply a mineral  
curiosity to a quasi-important article of  
commerce, on account of its peculiar qual-  
ities, being indestructible in fire or by acids,  
fibrous and capable of being woven into  
cloth or made into paper, often as fine as  
the finest flax or silk, or like spun glass,  
although strictly a mineral product. In early  
antiquity it was made the subject of curious  
myths and strange tales bordering on the  
fabulous. Practically its sole use then  
seems to have been for winding sheets, in  
which to burn distinguished dead, or to be  
spun into napkins which were used at  
exceptional feasts, and, to the astonishment  
of the guests, afterward thrown into the  
flames, to come out intact white and purified.  
At least Pliny mentions this; and it also  
would appear that Charles I. had table  
cloths made of it, which he also was accus-  
tomed to throw into the fire for the same  
purpose. More recently stockings and a  
handkerchief were made in Elba of asbestos,  
as gifts to Napoleon I., while living there in  
exile. From time immemorial the peasantry  
where it is found, in various countries, have  
turned it to economical use as an incombus-  
tible lampwick, for which purpose its power  
of capillary attraction admirably qualifies it.

Common asbestos, more or less fibrous,  
but of a powdery, brittle quality, is abun-  
dant in most countries, and begins to find  
its way into some of the industrial arts, but  
largely mixed with other materials. The  
strong, long, fibrous sorts, varying in color  
from pure white to dark brown, thus far are  
only found in sufficient quantity for com-  
merce in the Italian Alps, at elevations of  
several thousand feet, and often, for much  
of the year, buried under the snow. They  
occur in serpentine rocks in irregular veins,  
usually very narrow, and requiring much  
heavy labor and blasting to open. Some-  
times, but very rarely, masses are found in  
one lump weighing several hundredweight.  
More frequently the veins prove very superfi-  
cial, and give out almost at once. Then,  
again, they can be steadily worked for  
years, as they extend or penetrate into the  
mountain. Although some of these have  
been yielding as much fiber as there was a  
demand for since they were first opened in  
1871-2, recently the increased call has led  
to the discovery of new productive veins of  
the very best quality, which will increase  
the outcome from a few scores of tons per  
annum to several hundreds. But the price,  
heretofore varying from £50 to £100 a ton,  
according to the quality and condition of the  
fiber, threatens to grow firmer, owing to the  
new uses now springing up for it, mostly  
based on patents, while Italian capitalists  
themselves begin to see the importance of a  
mineral of which Italy has as yet a virtual  
monopoly, and are preparing to manufacture  
it on the spot where it is found into those  
goods which already find a steady and  
increasing demand.

These are chiefly steam packing in the  
rope or loose form for piston and pump rods,  
and stuffing boxes, and mill-boards for  
steam joints, gaskets, man-hole plates and a  
species of felting to cover boilers and steam  
pipes. The ability of asbestos to resist an  
elevated temperature, moisture, friction and  
flame itself, joined to its lubricating quality,  
specially recommends it for the above pur-  
poses. The chief objection of the manufac-  
turer is that when properly prepared and  
applied it lasts too long. As covering for  
boilers and pipes, it saves 25 per cent. or  
more of the waste heat; and in domestic  
uses in cellars, to prevent loss of heat by  
radiation, it is found to reduce the tempera-  
ture of the cellar 15 deg., while raising that  
of the house above to deg., i. e., it saves the  
furnace or steam heat, and sends it where it  
is most wanted.

Asbestos lining or sheathing paper, espe-  
cially for wooden houses, ceilings, floors and  
partitions, to prevent the spread of flames

and make each room fire-proof, is now  
attracting attention in America, and most  
recommends itself to builders generally, as  
rendering buildings not only safer from fires,  
but cooler in summer and warmer in winter,  
and free from insects that harbor in com-  
mon papers. These papers are made in rolls  
of any thickness or length, and can be  
colored or printed with any desirable pat-  
tern. Fire-proof boxes for shelves in shops  
can also be made of this substance, and  
society for theaters, if fabricated of it,  
would be impervious to flames.

The varieties of asbestos are quite aston-  
ishing to those who have not made a study  
of this mineral. No two localities seem to  
yield precisely similar fiber. In the cabinet  
of Mr. C. A. Wilson, Genoa, Italy, there are  
at least 100 distinct varieties from the Alps  
alone. One specimen when taken out of the  
mine was 5 feet long and weighed 700 lbs.,  
of the most delicate cream color, and soft,  
like raw silk, after separating the fibers.

In America the asbestos business is mainly  
in the hands of a Boston company, protected  
by some 15 patents on various goods, and  
begins to assume a prosperous condition,  
calling for increased supply of the crude arti-  
cle, while in Great Britain it is chiefly con-  
trolled in a flourishing Glasgow company,  
which was the first to risk the novel enter-  
prise of trying to utilize a well-known min-  
eral that has waited more than 2,000 years to  
become useful to men. In Paris it is begun  
to be adopted for civil and public registers  
in the form of a fire-proof writing paper.  
Recently, patents have been taken out in  
America and England to cover its use as a  
fuel-bed for petroleum in any sort of stove or  
engine-furnace. It absorbs and retains the  
oil, its capillary attraction causing it to burn  
only on its surface, where it is under perfect  
control, and gives out an intense heat. By  
a simple arrangement the hydro-carbons can  
further be converted into a gas fuel, so it is  
claimed.

## Cryolite.

The Greenland mineral cryolite, which  
attracted so much attention some years  
since, but which has of late passed some-  
what out of public notice, is taking a valu-  
able position in the arts. It is found pecu-  
liarly adapted for certain descriptions of  
glass manufacture, and its value in this line  
is yet to be fully utilized. A milk-white,  
somewhat translucent glass has for some  
time past been made from the pure article,  
and a uniformly colored or marbled variety  
of opaque glass is made from the impure. For  
the milky variety a mixture is employed  
consisting of the following materials: One  
part of oxide of zinc, four parts of cryolite  
and ten parts of sand ore, fused in a common  
pipe-clay crucible, developing a large  
amount of fluosilicic acid. The pipe-clay is,  
however, not attacked much by it. This  
development continues throughout the fusion,  
and even after it, during the working, to a  
small extent.

This glass possesses a considerable hard-  
ness and power of resistance, and even as  
a powder it is not attacked by strong acids.  
The properties of this glass probably depend  
upon the presence of the uncombined cryo-  
lite, for glass of the composition character-  
izing this, without any combination of  
fluorine, is transparent and not colored.  
Glass with a small amount of cryolite has a  
milky-white, translucent color and great  
brilliancy, refractive power and strength;  
with a higher proportion it becomes opales-  
cent, and with still more cryolite, opaque  
and like porcelain.

The success of Sir William Thompson's  
piano-forte wire apparatus for deep-sea sound-  
ings was demonstrated by the United States  
Steamer Tuscarora, in the Pacific Ocean,  
Commander Belknap having aided its success  
by his own skill and ingenuity. There is  
occasion for regret that it was not used by  
the Challenger Expedition; if it had been,  
a much larger number of soundings could have  
been effected. Latterly several experiments  
have been made with this apparatus on the  
White Star Line of steamers between this  
city and Liverpool. The wire was capable  
of bearing a strain of eighteen miles of its  
own length. In these experiments a glass  
tube was attached at a known distance above  
the sinker. The interior of the tube was  
coated with a mixture of starch and red  
prussiate of potash. Outside the tube was  
a metallic cylinder containing a solution of  
sulphate of iron. When the pressure of the  
water, at a given depth, drove in the sides  
of the cylinder, it forced the iron solution to  
a proportionate height in the glass tube,  
leaving its record in a blue tint. The height  
of the record indicated the pressure, and  
consequently the depth reached in sounding.

The Temeraire, one of the most powerful  
ironclads in the world, was commissioned  
at Chatham early in August, and will sail  
for the Mediterranean in September. She  
carries four 25-ton and four 18-ton guns.  
The Whitehead torpedo can be fired from  
either side, and the ship is also supplied with  
outrigger torpedoes, which are to be used  
from steam pinnaces. Gatling guns are pro-  
vided, and can be used in action from the  
tops, if necessary, or from boats, and they  
can also be used as field service guns. The  
thickness of her armor plating is 11 inches,  
and she is fitted below water with a most  
powerful ram. The trials of her engines  
have been most satisfactory, and at the trial  
trip, with all her weights on board, she  
attained a speed of nearly 15 knots an hour.  
Her complement is 530 officers and men.  
The electric light has proved so useful  
on board the Alexandra flagship in the Medi-  
terranean, that the Admiralty has given  
orders to provide the Temeraire with an  
apparatus of a similar nature.

A line of steamers has been established be-  
tween Marseilles (France) and the River  
Plate (South America), to convey fresh meat  
from the latter locality in a frozen condition.  
On one of the steamers the Fellier process is  
used for producing cold, by the volatilization  
of ether; on the other, the Carre process is  
employed, a temperature being obtained by  
the evaporation of ammonia which is said to  
be so low as to sheet the meat with ice.  
This seems to indicate that the machine was  
working wastefully since the temperature  
was needlessly lowered. The second vessel  
of the line started from Marseilles while the  
first was coming into port with a cargo.



# USE THE BEST.



Pawtucket, R. I.

The American File Company have the exclusive right to use the Bernot process for cutting files. By this method all the advantages of hand cutting are secured, together with an accuracy unattainable in hand work. They are the only manufacturers who employ machinery for testing files and steel.

Goods of all known manufacturers have been repeatedly tested, and interesting tables have been compiled showing the working qualities of files made by different makers, and of files made from different steels, and with various shapes and angles of tooth. They have thus reduced the manufacture of files to an exactness and perfection with a uniformity of result, as they believe, never before attained. No file, foreign or domestic, that they have ever tested, has equalled the performances of their own goods taken at random from their stock. Their machines are capable of the most delicate adjustment, and can produce the very finest work known to the trade. Special files made to order. Prominent file manufacturers are having their best goods from our works.

Price lists and information furnished on application.

**AMERICAN FILE CO., Pawtucket, R. I.**

Granted for



After more than Fourteen Years of Competition  
**McCaffrey's Philadelphia Hand Cut Files and Rasps**  
Have Proved their Great Superiority.

Superior Goods.



Silver Medal.



Messrs. **ARNOLD & CO.,**

310 California St., San Francisco,

Sole Agents for Pacific Coast.

Highest Premium.



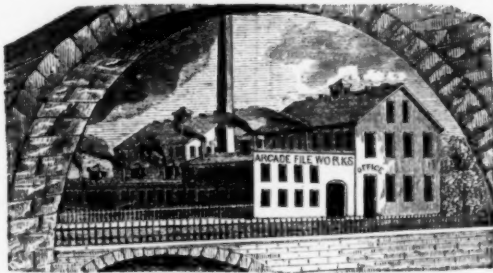
**AUBURN FILE WORKS,**  
Superior Hand-Cut  
**FILES AND RASPS,**  
MADE FROM IMPORTED STEEL. EVERY FILE WARRANTED.  
**FULLER BROS., Sole Agents,**  
89 Chambers and 71 Reade Streets, N. Y.

ESTABLISHED 1848.

C. T. DRAPER & CO.

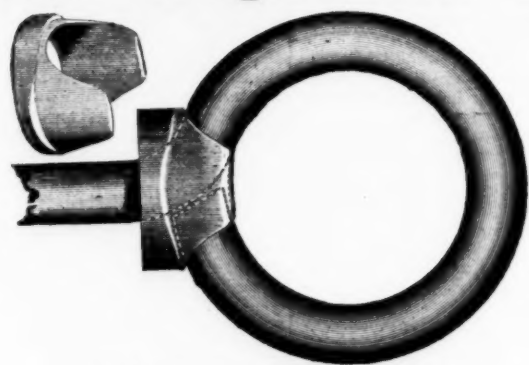
Sing Sing, N. Y.

Manufacturers of SUPERIOR  
**HAND CUT**



**FILES AND RASPS**  
Made from Best  
**ENGLISH CAST STEEL.**  
Quality guaranteed by written warranty  
when required.

**Patent Wagon Box Rod.**



Wagon Box Rods.

With wrought Nut and Washer, together with Patent Shoulder, making a perfect bearing, and also clamping the eye so it cannot be twisted out of shape. The eye is bent at a cherry red heat—therefore the iron at the base of the eye is not burnt or injured.

**BROWN & CURTISS,**

MANUFACTURERS OF

**Patented Wrought Iron Wagon Hardware**

AND

**SPECIALTIES IN WROUGHT IRON,**

Cleveland, Ohio.

Send for illustrated price list.

**GOLD MEDAL**  
**Non-Extensible Razor Belt.**

PATENTED JULY 25, 1871.

RE-ISSUED MAY 13, 1873, and JUNE 9, 1874.

In this Strap the liability of the leather to stretch and become loose and porous is prevented by the use of a patented non-extensible base, which supports the leather and secures

**PERMANENT ELASTICITY.**

We make this style with single rod, double rod, and wood frames, and intend that it shall, in quality compare favorably with our other well known brands.

**BENJAMIN F. BADGER & SON, Manufacturers,**

Badger Place, Charlestown, Mass.

**HORSE RASPS AND FILES.**



We invite the attention of the trade to our Celebrated American Horse Rasps and Files, made from the very best American Steel and cut by hand, and warranted to give entire satisfaction. All Rasps and Files not stamped as the annexed incorporated trade mark are not genuine. Sold by Hardware dealers generally.

**FILES & RASPS,**

Best Cast Steel.

**HAND-CUT. Manufactured by**

**JOHNSON & BRO.**

No. 1 Commercial Street, Newark, N. J.

Established 1835. **TRADE MARK ON**

New Pattern

**Horse Rasps,**

John Rothery's

**HAND-CUT FILES AND RASPS,**

Made from English Cast Steel.

**JOHN & WILLIAM ROTHERY,**

Matteawan, N. Y.



**Putnam's Government Standard FORGED**

**Hammer Pointed HORSE SHOE NAILS, READY FOR DRIVING.**

Manufactured from the best of NORWAY Iron, and warranted to give entire satisfaction.

**S. S. PUTNAM & CO.,**

NEPONSET, MASS.

**Scroll Saws**

**SAW BLADES, WOOD DESIGNS AND MATERIALS.**



**FLOWER POT BRACKETS, Aquaria, Flower Stands, &c.**

AGENCY FOR

**S. H. & E. Y. Moore, Anti-Friction Barn Door**

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**S. H. Lechman, best of all Egg Beaters.**

**Rush & Smith, Model Scroll Saws.**

**Johnson & Bro., Hand Made Files.**

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**STEERING APPARATUS,**

For Steamships, &c., made and fitted up.

**Iron Pumps Reamed & Re-Chambered.**

Also, Patent Pressed Pump Leathers, Galvanize

Iron Hanks, Gars, Mast Hooks, Hanks, Belay's

Pins, Hand Spikes, Capstan-bars, Hand Pumps, &c.,

and every article appertaining to the trade, of the

best material. General dealer in Lignumvite

**LENNOX & PAINE**

Manufacturers of

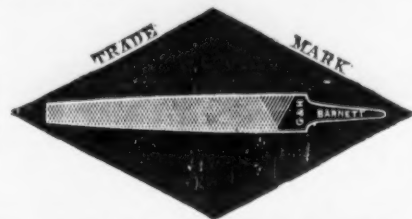
**Iron, Brass & Steel Work.**

Particular attention paid to Model Making.

Go to cutting for CLOCK WORKS, &c., a specialty.

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## Black Diamond File Works.



Awarded by Jurors of Centennial Exposition, 1876, for  
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**G. & H. BARNETT,**

39, 41 & 43 Richmond St., Philadelphia.

ESTABLISHED IN 1816.

NO CONNECTION WITH ANY OTHER HOUSE.

**PETER A. FRASSE & CO.,**

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AGENTS for the American Screw Co.'s Machine Screws and Taps.

SOLE AGENTS Thos. Turner & Co.'s, Files, Horse Rasps.

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DEALERS IN Scroll Saw Machines, Bracket Saws, Wood and Patterns.

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Warranted CAST STEEL. 187 Tenth Street, Williamsburg, New York.

All descriptions of Files made to order. Price List mailed on application. Established 1863.

**AUSABLE HORSE NAILS**  
POLISHED OR BLUED.  
**HAMMERED AND FINISHED**



**The Ausable Nails**

Are Hammered Hot,

And the Finishing and Pointing are

Done Cold,

Thus Imitating the Process of Making Nails by Hand.

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With Flat, Round, Oval, Depressed, Screw and

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Molding and Finishing Nails, with or without heads. Brush Makers', Upholster-

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Shoe Nails of Brass and Iron. Bright Iron Rivets. Brass and Iron Escutcheon

Plugs, with flat, round and fancy heads, all sizes on hand and to order.

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COHOES, N. Y.

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Manufacturers of

**AXES**

Of all kinds.

Hatchets, Adzes, Grub Hoes, Mat-

tocks and Picks.

Catalogues and Price Lists furnished upon ap-

plication.

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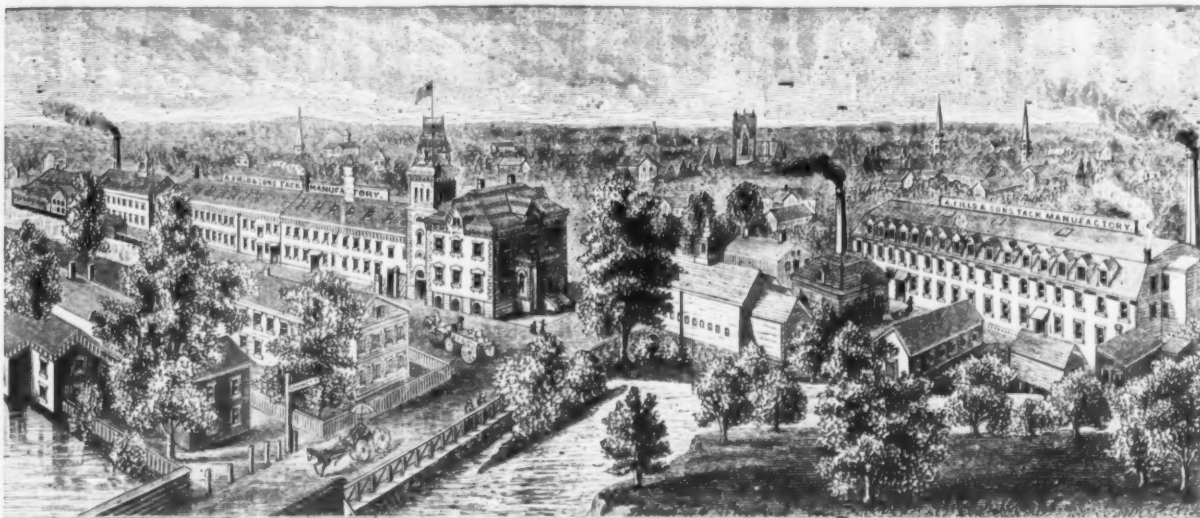
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## Harvesting Machines.

BY EDWARD A. UHLING, M. E.

Agriculture has been called "a practical experimental science." It is certainly pre-eminently practical, in a great degree experimental, and offers a most fertile field for the application of science.

The natural sciences—physics, botany, chemistry, etc.—are applicable and prove profitable in farming whenever called upon to assist the intelligent husbandman. Many able works have been written setting forth the advantages which would be derived if agriculture were carried on in accordance with scientific principles. Notwithstanding these noble efforts, farming in general has only been indirectly benefited by the advance of natural science.

Technics, on the other hand, has not only had a direct bearing upon agriculture from its beginning, but in the present century has almost completely revolutionized the mode of farming. Mechanical skill and inventive genius have affected means for performing the severest labors by animal and other power, which are thus made directly to increase the welfare and comforts of man.

The manufacture of agricultural implements has risen to one of the leading industries of our country. Its progress has been as rapid as its development is great. Implements and tools of husbandry which less than a century ago either did not exist at all, or if they did were of the rudest and most inefficient form, are now models of beauty and perfection. Labor-saving machines, in which animal, steam, water or wind-power are employed, are rapidly and more and more generally taking the place of hand tools in which man-power is the only force applicable. Among the innumerable modern labor-saving machines there is none of greater importance than the harvesting machine.

Considering that there are in the United States no less than 33,000,000 acres of cereals, yielding about 600,000,000 bushels of grain, and over 20,000,000 acres of grass, yielding nearly 24,000,000 tons of hay, to be annually harvested, it becomes evident that harvesting machines are an important factor in the political economy of our country. Nearly a million of these machines are in operation every harvest in the United States alone, embodying all the useful features of upward of 2000 patents.

The first account of a harvesting machine we have is given by Pliny the Elder, about A. D. 70, at which time it seems that reapers were in use in the Lowlands of Gaul, which he described as carts of large size with projecting teeth at the forward end, being pushed through the standing grain by an ox. If the account given by Paladins, an Eastern prelate, born A. D. 391, who describes the action of a similar machine, may be relied upon as correct, then reapers were in successful operation more than 1500 years ago. He says: "All the ears are caught by the teeth and fall into the cart, the broken stalks being left behind the driver, who follows, regulates the elevation and depression of the teeth, and thus by a few courses backward and forward the whole crop is gathered in the space of a few hours."

After the time of Paladins nothing more is heard of harvesting machines until the idea of making available animal power for cutting grain was again revived in England toward the close of the last century. In 1787 William Pitt, of Pendeford, invented a machine whose cutting apparatus consisted of a large cylinder, from the surface of which projected numerous rows of curved teeth which hatched off the heads of the grain as the machine was propelled through it and dropped them into a box behind.

The first patent for a reaping machine was obtained in England by Joseph Boyce on the 4th of July, 1799. Somewhat later Thomas Pluckett obtained a patent for a reaping machine in which the cutting apparatus consisted of a plain circular disk, which was suspended below and forward of the axle, supported on two large wheels.

About the year 1800 Mr. Gladstone, of Castle Douglas, invented a machine which had, in addition to the smooth-edged rotary cutter, numerous teeth projecting into the standing grain. It was the first machine in which the team was hitched in front, and the first which had a delivery attachment.

The reciprocating cutter, the most important principle even of our modern machines, was first brought out by Mr. Ogle, an English schoolmaster, who invented a reaper about 1822 which seems to have been simple and effective. From a short trial it was estimated that it could cut 14 acres per day. But Mr. Ogle says "some working people threatened to kill Mr. Brown (the builder of the machine), and it was never more tried."

In 1826 Rev. Mr. Bell, of Scotland, invented a machine for reaping grain, which is the oldest known reaper whose pattern is still in use. In this machine there is an adjustable reel, Ogle's reciprocating cutters and an endless apron for delivering the grain in a continuous swath. Various trials were made with this reaper in 1828 and 1829; one of them in presence of 50 farmers elicited from them a signed declaration, that, moved by two horses, the machine could cut an acre per hour. Although there is unquestionable proof respecting the successful working of Bell's machine in 1828, it seems to have attracted but momentary attention, as it was soon lost sight of almost entirely, until England was reawakened to the utility of harvesting machines, through the success attained by the celebrated McCormick reaper at the Great Exhibition in 1851.

The attention of American inventors was directed to the importance of harvesting machines at an early period of the history of our country, and we find that a patent was granted to Richard French and J. T. Hawkins as early as 1803.

The first American reaper, which possessed nearly all the important features of the modern machines, was that of Obed Hussey, patented 1833. Hussey's machine, on account of its involving correct principles, was successful from the beginning. The first public trial took place in a harvest field in July, 1833, before the Hamilton County Agricultural Society, near Carthage, Ohio,

where it was pronounced an entire success. Hussey's reaper was rapidly introduced into several States. In 1838 he removed from Ohio to Baltimore, where he continued to build his machine.

About this time inventors in different parts of the world became aware of the utility of harvesting machinery. A reaper was invented in Odessa in 1831, one in Vienna in 1839 and one in Australia in 1845. From this time (about 1830) up to the Great Exhibition in London in 1851 nine letters patent were issued in England for reapers and improvements thereon.

Notwithstanding that all these various attempts in different parts of the world had been made to produce and introduce machines for cutting grass and grain, and although some of the machines had been, mechanically, tolerably successful, it was not until the McCormick reaper had gained its overwhelming popularity, and thus cleared away the greatest obstacle—prejudice—that the era of rapid development commenced. From the close of the Crystal Palace in 1851, to the end of 1852, no less than 25 English patents relating to harvesting machines had been issued. In the United States the development of harvesting machines continued with increasing rapidity, so that at present about 100,000 machines are annually being built, of which number from 5 to 10 per cent. are exported.

Harvesting machines may be classified according to two general principles:

A. With reference to the work for which they are designed:

- 1st. As reapers for cutting grain.
- 2d. As mowers for cutting grass.
- 3d. As combined machines so designed that, by a slight alteration, they may be employed for cutting either grain or grass, as may be desired.

Reapers are again classified as to the mode of delivering the cut grain: as droppers, hand-rakers, self-rakers, hand-binders, self-binders and headers. These may be further subdivided with regard to their principles of motion, as we shall see further on.

B. According to structural features:

- 1st. With reference to the number of driving wheels, as single and double drivers.
- 2d. With reference to the position of the cutter bar, as front-cut, center-cut and rear cut.
- 3d. With reference to the wheel base as a linear and polygonal base.

In the operation of harvesting machines three distinct forms of motion are met with:

1st. Progressive motion, directly obtained from the motive force, which, excepting here and there an experimental trial by steam, is always animal power in propelling the machine through the grain.

2d. Rotary motion—derived from the former through one or two driving wheels; it is increased or diminished in velocity as is required by means of gear wheels and pinions of suitable size and strength. Belts and chains are very rarely employed, except for driving the reel.

3d. Reciprocating motion—obtained directly from the preceding, generally by aid of the crank and connecting rod, but, in some few cases, cam movements are employed.

Besides these three forms of motion, which are common to all modern reaping and mowing machines, there are others more or less complex, employed in the attachments for delivering the grain.

The resistances to be overcome in the operation of harvesting machines are as follows:

1st. That due to the transport of the bulk of the machine, including the driver, and in reapers a variable quantity of cut grain; if the machine is a hand machine, the weight of the raker-off or binders must be added. This resistance varies with the total bulk of the machine, with the nature, condition and location of the soil, and also with the height and width of the supporting wheels. On soft soil large and wide wheels offer considerably less resistance for the same load than small and narrow ones.

2d. That due to friction caused by the rubbing of the divider shoe, guard fingers and other parts, against the stubble and the stalks of the standing grain. This resistance, though always appreciable, is generally quite small; but in heavy, lodged and entangled grain or grass often becomes very considerable.

3d. Resistance to be overcome in forming and delivering the gavel or sheaves. This depends, first, upon the heaviness and condition of the grain; second, on the kind of delivery attachment, a dropper requiring but very little force in doing its work, while rakes and aprons consume a considerable percentage of the total effort applied to the machine.

4th. Resistance of the knife offered by the stalks of grain and grass against being severed by the cutting edge. The value of this depends upon the nature, condition and thickness of the crop, as well as the sharpness of the knife. What effect the shape of the knife sections, their velocity, distance between guards, etc., have upon the resistance against cutting, will be touched upon further on.

5th. Resistance caused by the friction in the mechanism. The greatness of this depends upon the accuracy of workmanship and the nature and quality of the material, as well as on careful lubrication and protection against dust and grit. The two latter points are but too often neglected in harvesting machines.

6th. The inertia of the rapidly reciprocating parts, the sickle and connecting rod. This resistance is quite appreciable and increases with the weight of the reciprocating parts and with the rapidity of their motion. By the draught of a machine we understand the total effort, measured in pounds, necessary to propel the same through the field, while doing full work at the ordinary speed. The draught being a summation of all the variable resistances considered above must necessarily be a variable also. The average draught of a reaper cutting a 5-foot swath at a speed of 240 feet per minute is about 240 pounds; that of a mower cutting a 4-foot swath with the same speed is about 180 pounds; both working under quite favorable circumstances. Unfavorable circum-

[Continued on page 11.]



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[Continued from page 9.]  
**Harvesting Machine.**

stances, such as on grade, mellow soil, excessive moisture on the one hand and heavy, green, entangled and lodged grain on the other, together with increasing dullness of the knives, may cause the draught to become more than double the figures just given. The tendency with most builders, at present, is to diminish the draught of their machines by reducing the weight of them, but if the resistances due to other causes are not lessened in the same proportion the machines may be rendered ineffective from the want of dead weight, as we shall endeavor to show further on.

Side draught is a force acting at right angles to the pole tending toward the standing grain. It is very objectionable when present in a considerable degree, requiring an additional exertion of the team to keep the machine in its right course, and extra attention on the part of the driver to keep the animals from being crowded into the standing grain. Side draught is caused by the difference between the moments of resistance of the grain wheel and that of the driving wheel around a vertical axis through the pole. Although the resistance of the grain wheel is small as compared with that of the driving wheel, yet the lever arm of the former being many times greater (it varies in every type of machine), its movement is generally slightly and in many machines considerably in excess; the side draught, which is always measured at the end of the pole, varying from 10 to 30 pounds. Anything above the latter number becomes a serious objection.

Side draught may be reduced in two ways, viz., either by diminishing the ratio of the lever arm of the grain wheel to that of the driving wheel, or by diminishing the ratio of their respective loads. The latter is by far the most advisable, since it lessens the weight on the grain wheel, where it can do harm only, and adds it where it may become useful in rendering the driving wheel more effective.

The work done in operating a harvesting machine is found by multiplying the average draught D into the space S passed over. Algebraically expressed:

The work  $W = S D = \sum f R ds$ .  
The latter term indicates a summation of all the variable resistances already noticed. The values of  $f R ds$  cannot generally be mathematically determined, because the resistances, R, being influenced by so many different conditions, do not vary according to any known law.

Practically, none of them except the transport of the bulk have ever been determined with sufficient accuracy to justify putting them in here. In the first place, they could only be found, without considerable difficulty, by a series of very careful experiments; and in the second place, manufacturers have not yet been sufficiently impressed with the great necessity of determining just where the energy imparted to the machine is wastefully consumed before they can intelligently make alterations toward reducing the draught of their machines.

With an advance speed of 240 feet per minute, the average draught of mowers is 180 pounds; that of reapers, about 240 pounds. One acre contains 43,560 square feet; hence, for mowers whose average width of cut is 4 feet, the linear space passed over in cutting one acre,

$$S = \frac{43,560}{4} = 10,890 \text{ feet.}$$

Calling W the work done in cutting an acre of grass and D the draft of the mower, we have from the general formula  $W = D S$   
 $W = 180 \times 10,890 = 1,960,200 \text{ foot pounds per acre.}$   
For reapers cutting a 5-foot swath

$$S = \frac{43,560}{5} = 8,712$$

feet of advance motion per acre, and  
 $W = D S = 240 \times 8,712 = 2,090,880 \text{ foot pounds per acre.}$

Denoting the space passed over per minute by  $S_1 = 240$  feet, we have for the rate of work for a mower:  $W_1 = D S_1 = 180 \times 240 = 43,200 \text{ foot pounds,}$  which number, divided by 33,000, gives 1.31 horse-power exerted in operating a mower. And for a reaper we have:  $W_2 = D' S_2 = 240 \times 240 = 57,600 \text{ foot pounds}$  divided by 33,000 gives 1.75 horse-power.  
(To be continued.)

**Philadelphia Mechanics Going to Kansas.**—A few days ago a large meeting of workmen was held in Philadelphia in furtherance of a scheme of colonization in Kansas. John Pinkerton presided. The first business considered was the report of the Executive Committee, in which Kansas was recommended as the spot for the association to select for emigration. The report proceeded, viz., that the permanent association be baptized "The Fraternal Land and Home Association of the United States." Three hundred families have already applied to be enrolled among the aspirants who desire to shake the dust of Philadelphia from their feet. The plan of the Association is as follows: They will secure a deed for forty or more acres of land to any person who will pay five dollars per acre, and will agree to allow the association to improve it for the term of four years, at the end of which the deed will be returned on receipt of five dollars per acre and six per cent. interest. The association will also agree to cultivate any number of acres for any person who will purchase land in the vicinity of the colony, provided the buyer furnishes seeds and implements and takes one-half the crops as payment. At the end of six years, if the purchaser desires, the association will agree to take the land back at what it cost, and six per cent. interest. It is also proposed to start herds of sheep, cattle and hogs, to be held intact for five years and to be cared for and fed by the colony on shares, the latter being held at \$10 per share. The herds, however, will not be started until three hundred shares are subscribed for. The report and plan were adopted. One member of the committee believed that 20,000 people in Philadelphia are ready to rush at once to the potato bugs and Colorado beetles that infest Kansas. John Pinkerton was elected permanent chairman; Ed. M. Smith, secretary, and N. G. Thompson treasurer. After some speech-making the meeting adjourned.



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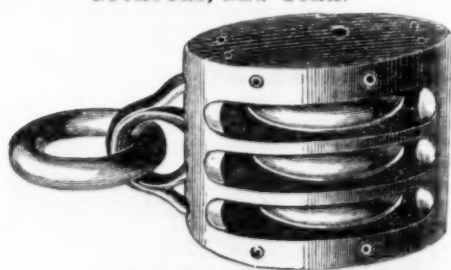
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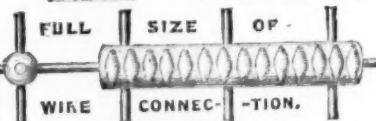
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## The Chinese in California.

Our article in a recent issue of *The Iron Age* entitled "A Chinese Protest against American Civilization," has called out an indignant protest from the Pacific Coast. One correspondent sends us a copy of the report of the committee of the California Legislature appointed to prepare a memorial to Congress on the question of Chinese immigration. This we print in full on another page. After careful reading of this report we find in it nothing to change the opinions we expressed in our article. That the Chinese are an evil in San Francisco we do not doubt. The same is true of a class of the population of every city. In New York we have square miles of dens occupied almost wholly by the vicious and those living in voluntary squalor. They are as much a class by themselves as the Chinese in San Francisco, with the single exception that they have political rights which they almost always abuse—giving their suffrages to demagogues seeking office for dishonest gains. If a legislative committee of this State should investigate and report upon the classes in New York which in some degree correspond to the Chinese in San Francisco, they could make a startling showing and one which would furnish materials for a strong argument against all immigration into the United States.

That the Chinese in San Francisco live under conditions inimical to the public health is clearly the fault of the municipal authorities. They are as amenable to local health laws and municipal ordinances as any other class of residents, and, if necessary, could properly be made the subject of special enactments—not being citizens. A suitable policing of the district would suppress any unlawful practices, and the slavery spoken of in the report can exist only with the consent of the enslaved. It is at most only a nominal servitude, and we are well satisfied that there are, to say the least, thousands of Chinese on the Pacific Coast who recognize no obligation to any company or association. The moral effect of the immigration of Chinese women may be as bad as is stated, but if so it is clearly a matter of police regulation.

That the Chinese are incapable of adapting themselves to the institutions of civilization because "the national intellect of China has become decrepit from sheer age," is a statement which lacks proof. All that China is suffering from to-day is the natural effect of centuries of national isolation. All that the Chinese people need to make them formidable competitors with the greatest producing nations of the world, is contact with a modern civilization. They are by no means idiots or beasts. What so many have become in this country is due to the conditions under which they have been compelled to live since coming here.

We now come to that portion of the report which deals with Chinese "cheap labor." We are compelled to say that much of this is sheer demagoguery. The apologetic tone in which the committee speak of the acts of violence committed by the whites of the Pacific coast against the Chinese, should make every citizen of the State ashamed of his representatives in the Legislature. There is nothing which excuses the outrages that have been committed by the Chinese-hating "hoodlums" of San Francisco, and that such violence has not been severely and promptly punished is a stain upon the records of the city. The comment of "Ah Sin" in the play, "Too much civilized," is a bitter satire upon a kind of civilization which permits white men to gratify a lust for blood at the expense of Mongolian immigrants whose only offense is that their victims are not like themselves. The worst feature of the case is that these ruffians are to some extent sustained and encouraged by public opinion. We doubt the advantage of continuing in operation the treaties under which a wholesale Chinese immigration is encouraged. They should, in this matter, stand upon the same plane as the people of other nations. If possible it would be well if the Chinese colony in San Francisco could be broken up and such of its members as are not employed at useful labor scattered where labor is wanted. The only trouble is that a majority of these people are in the wrong place. Exactly the same is true of some hundreds of thousands of the people living in the bad neighborhoods of New York.

In conclusion we venture the opinion that the great outcry against "Chinese cheap labor" comes from men who do not want to work, and who, at heart, are glad of an excuse for not doing so. We also believe that the presence of Chinese labor on the Coast is of the greatest benefit to employers and workmen. Without this there would be not only a scarcity of labor, but the white laborers would make such unreasonable demands that nearly all the industries of the Pacific Coast would be brought to a standstill. An example of this comes to hand as we write, in a San Francisco paper which publishes the following news item:

We regret to see that the efforts of those who are desirous of helping the laborers on this coast are thwarted by the laborers themselves. Mr. Zaine, of Anaheim, below Los Angeles, tried the experiment of putting on white labor and discharging the Chinese he was employing in his hop fields. As he could not obtain at once all the white labor he required, he was obliged to retain some of the Chinamen. The white men soon after getting the position struck for higher wages, and a quarrel arose between them and the Chinese, which ended in driving the latter from the ground. And now Mr. Zaine has to sustain a loss which he would not have experienced had he adhered to the plan under which he had been working. It is strange that men will be so blind to their own

interests as to break up the very endeavors of those who are disposed to benefit them.

The trouble with Chinese immigration is that it has not been well handled. If it had been diverted into a dozen different districts of the West it would have been absorbed with advantage to all classes of the community.

## Immigration in its Bearings on our Prosperity.

The years in which immigration into the United States has been largest, have generally been the most prosperous. This is not wholly because of a large influx of population, but from a combination of favorable circumstances. Thus the decade which followed the discovery of gold in California was one of great progress and prosperity, while it was also one of large immigration. Gold was discovered February 24, 1848, and on the same day Paris was convulsed by a revolution which set on fire the whole of Europe and caused valuable men of all classes of society to leave the old world for the new by hundreds of thousands. Revolution and war trampled under foot the broad grain fields of central Europe during several years in succession, and supplies from here were demanded. The enormous requirements of the California markets imparted a great impulse to manufacturing in the Atlantic States, and in return shipments the precious metal came pouring in from the Pacific in rapidly increasing amounts. This was the time when our magnificent clipper fleet was built, and when our fine ocean side-wheel steamers conveyed hundreds of thousands of passengers to and from California and Oregon via Panama, Nicaragua and Realejo. A similar coincidence of fortunate circumstances rarely occurs even in the history of a young nation of great energy and enterprise like our own, and none such has happened since to enrich all the States alike. If the war caused prosperity in some Middle and the Eastern States, it crippled the South for a generation, and to a certain extent the whole country still feels its disastrous consequences.

During the past few months events in Europe have taken such an unexpected turn, that a period like the one begun in 1848 may be near at hand, and what we are able to spare the Old World may be in greater demand than ever before. While Europe is thus once more on the threshold of great events, emigration from there will no doubt again assume larger proportions, and we are likely to have our full share of this transfer of labor and capital. Whenever a large immigration of a desirable nature occurs in a country like ours, real estate and the building trades are immediately stimulated, perhaps more so than there is any reason for, especially in the great cities on the seaboard and on the lines of travel westward. The influx of these immigrants instead of lowering wages rather tends to advance them. The money which these people bring with them is so much added to the circulation, for these immigrant funds are most of them soon invested in lands, in stores, and in tools for a trade.

A large and valuable influx of foreigners is, under the circumstances we have pointed out, most desirable, and would assist us materially in setting everything right again. In view of the importance of the subject, we have gathered some emigration statistics which may assist in showing the general drift of the exodus from Europe since the beginning of this century:

The United Kingdom.—Total emigration from 1815 to 1875, inclusive, 8,306,720; yearly average, 138,445. This emigration was distributed as follows:

	Percentage.
To United States.....	5,301,542
Canada.....	1,536,683
Australia.....	1,132,437
Other countries.....	246,058
Total.....	8,306,720

Irish emigration has of late years been on the decrease, as the following figures will show:

	English Emigrants.	Irish Emigrants.
1865.....	61,345	100,676
1866.....	58,850	98,800
1867.....	55,494	88,622
1868.....	58,268	64,965
1869.....	90,416	73,255
1870.....	105,293	74,283
1871.....	102,452	71,067
1872.....	118,190	72,763
1873.....	123,343	63,692
1874.....	116,490	60,491
1875.....	84,540	41,449

Germany.—Total emigration through German ports from 1815 to 1875, inclusive, 4,064,251; yearly average, 67,737.

Scandinavian States.—Denmark.—In 1871 there sailed from Copenhagen 6422 emigrants, 5492 of whom for the United States, 19 for Canada, 156 for Brazil, and 1755 for Australia. Sweden.—While between 1851 and 1860 the annual average of emigration was only 1690, it rose to 12,245 between 1860 and 1870. In the latter year no less than 29,003 emigrated, the number declining to 17,450 in 1871 and 13,580 in 1872. Norway.—The average between 1856 and 1865 has been 5400 annually; in 1870 it rose to 14,288; in 1871 it declined to 12,535; it was 13,865 in 1872, 10,352 in 1873, and but 4600 in 1874.

Belgium.—There left Belgium through the port of Antwerp in 1843, 3179; in 1850, 7016; in 1860, 2442; in 1864, 5827; in 1865, 3507; in 1868, 1790; in 1869, 8873; in 1870, 126; in 1871, none; in 1872, 1403; in 1873, 6294, and in 1874, 5316.

Holland.—The departure of emigrants has been during the decade 1845-1854, 20,407 all told, or 2041 on an average.

Switzerland.—The number of persons emigrating between 1868 and 1874 was 30,000, all of whom left for transatlantic countries. In 1874 only 2672 left, against an annual average of 4547 during the preceding five years.

France.—Total emigration by sea from 1865 to 1874 inclusive was 342,471 souls, of whom 72,761 were Frenchmen and 269,710 foreigners. Among the latter there were 91,330 Italians, 60,432 Germans, 15,971 Spaniards, 8599 Americans and 93,378 English, Swiss and Belgians. This emigration from France was distributed as follows: To United States, 211,512; to Argentine Republic, 75,675; to Uruguay, 35,397; to Brazil, 10,381; to Venezuela, 911, and other countries, 7595.

Italy.—There left for transatlantic countries in 1870, 25,000; in 1871, 30,000; in 1872, 35,000, and in 1873, 45,000.

The principal countries attracting European emigration outside of the United States are Canada, the Argentine Republic, Uruguay, Brazil and Australasia.

Canada.—The average annual immigration may be set down at 18,000 actual settlers. There were in Canada in 1871, 498,277 native Englishmen and Irishmen, 24,162 Germans and 2899 French in the four provinces of Ontario, Quebec, New Brunswick and Nova Scotia alone.

Argentine Republic.—There arrived from Europe, in 1868, 29,234 persons; 1869, 39,934; 1870, 41,058; 1871, 21,758; 1872, 41,002; 1873, 79,712, and 1874, 68,277. Those of 1873, the largest number on record, were composed as follows: Italians, 26,778; Spaniards, 9185; Frenchmen, 7431; Swiss, 1649; Englishmen, 1588; Germans, 796, and other nationalities, 855.

Uruguay.—From 1867 to 1874 the annual average immigration was 18,000, mostly Italians, Spaniards and Frenchmen.

Brazil.—The census of 1872 shows a foreign population of 243,480 souls, of whom 121,246 were Portuguese, 45,829 Germans, 6108 Frenchmen, 5558 Italians and 3145 Spaniards.

Australia.—In 1845 there arrived but 1000 English immigrants; in 1852 they had reached a total of 83,237; in 1864 the number of persons arriving had fallen to 40,000, and in 1873 to 15,000; of the latter but 1500 were foreigners.

United States.—The net immigration into our country has been as follows:

Fiscal Years.	Gross Number.	Annual average.
1790 to 1820.....	250,000	8,300
1820 to 1830.....	151,824	15,182
1830 to 1840.....	599,125	59,912
1840 to 1850.....	1,713,254	171,325
1850 to 1860.....	2,298,214	229,821
1860 to 1870.....	2,494,450	249,445
1871.....	321,395	7,803,865
1872.....	404,866	
1873.....	459,803	
1874.....	313,339	
1875.....	227,496	
1876.....	159,961	
Total.....	1,896,782	
Up to 1871 the nationality of immigrants into this country was as follows:		
English, Scotch and Irish.....	3,897,830	
German.....	2,379,781	
Scandinavians.....	177,353	
French.....	245,812	
Italians.....	26,776	
Other nations.....	1,163,313	
Total.....	7,803,865	

The great falling off in 1874-1876 was brought about by the unfavorable advices from here regarding the labor market, and emigration to America will not be as vigorously resumed as in 1871-1873, until a marked revival in trade, industry and agriculture takes place, or an unexpected series of political events in Europe, such as war or revolution, induces a fresh exodus of the masses.

We do not possess statistics from either Portugal or Spain, nor from Austria, British India and China. Emigration from Portugal to Brazil, the Azores, Madeira, the coast of Africa and the East Indies, since Vasco da Gama discovered the route to the Indies round the Cape of Good Hope in 1497, and since the discovery of Brazil in 1499, has been on an extensive scale, considering the smallness of the home population, and it is large to the present day.

Spain has been a continuous source of emigration since 1492, to the neglect and injury of the Peninsula, whose magnificent agricultural and mineral resources have, to a considerable extent, remained undeveloped, and which only quite recently have begun to attract attention through the extension of railroad lines all over the country. Spanish emigration since the days of Columbus, in the aggregate can hardly fall much short of the number of people who left the British Isles and the Netherlands combined; to the present day large numbers annually leave Galicia, Old Castile, the Basque Provinces, the Canaries and Catalonia, and as they are sober industrious and economical, they are classed among the most desirable immigrants everywhere. Strange to say, one of the most valuable Spanish colonies, the Philippine Islands in the Pacific, has attracted but a comparatively small number of people from the mother country. This, we believe, is mainly due to the great distance, which also to a certain degree militates against emigration from Europe direct to the Cape of Good Hope, Australasia, Chili and Peru, the West Coast of Mexico, and our own California and Oregon.

The number of coolies who left British India and China for countries in the Pacific and the West Indies and South America during the past thirty years has been notoriously large, and probably does not much fall short

of half a million. Java, the Straits, Australia, the Cape, Mauritius, Trinidad and British Guiana on the one hand, and California and Peru on the other have received the bulk of this Asiatic emigration.

From Austria there emigrated during a number of years, dating from 1849, a great many Hungarians to California and elsewhere, among them mineralogists and agriculturists of note, who have contributed not a little toward developing the resources of the Pacific slope.

The drawing of a large slave population from the West Coast of Africa was inaugurated during the life time of Las Casas, about the year 1551, and was clandestinely continued to Cuba and Brazil as late as fifteen years ago. No statistics will ever be procured to show even approximately how many negroes have thus been transferred direct to tropical countries beyond the seas during the past three hundred years, but the total probably approaches four million souls at the lowest estimate.

Viewed from a general standpoint, transatlantic emigration has been a great boon, both to the mother countries from which it started and to the new regions receiving it. It has opened new sources of wealth everywhere, and relieved poor countries of a surplus of population. It has stimulated navigation, commerce and industry, and infused new blood where it often was much needed.

## The Position of Tin Plates.

The gradual decline in iron, block tin, coal and wages, has enabled the makers of tin plates to lower their prices considerably during the past four years, thereby stimulating consumption all over the world. The art of Japanning has also made great strides since the decline in varnishes; the preserving of fruits in tin instead of glass jars, the canning of lard and provisions, as well as of garden vegetables and fruit, has assumed vast proportions; stamped tinware and tin toys have of late been introduced on an extensive scale; summer cooking-stoves have become quite popular, and require tin in large quantities; in short, it may be asserted that tin plates, so long as they remain cheap, will have an immense and constantly increasing utility. It must not be overlooked, however, that on the other hand there has been a tendency to overproduction among the plate makers in Wales, which has frequently led to mischief. Many new works have been started not financially strong enough to stand the competition of the older concerns, and their necessities have often forced large lines on the English markets at ruinous prices. Untimely speculation on both sides of the Atlantic has also frequently wrought bad results. To the maker, importer and dealer in plates, they have been a source of anxiety and loss until within a couple of months past, when an increased American consumption and a simultaneous reduction in the working time in Wales placed them once more on a safer and steadier basis. The following table shows the value, on the dates indicated, of ordinary brands at New York, in gold, per box:

	July 1, 1874.	April 28, 1876.
Charcoal Bright.....	\$6.62 1/2 to \$6.75	\$6.62 1/2 to \$7.37 1/2
Charcoal Tarnished.....	6.00 to 6.25	6.75 to 7.00
Coke Tin.....	8.00 to 8.25	6.12 1/2 to 6.37 1/2
Coke Tarnished.....	7.00 to 7.75	5.37 1/2 to 5.50
Average.....	\$6.71	\$6.58
	May 5, 1877.	Sept. 7, 1877.
Charcoal Bright.....	\$6.62 1/2 to \$6.75	\$6.62 1/2 to \$7.37 1/2
Charcoal Tarnished.....	6.00 to 6.25	6.75 to 7.00
Coke Tin.....	8.00 to 8.25	6.12 1/2 to 6.37 1/2
Coke Tarnished.....	7.00 to 7.75	5.37 1/2 to 5.50
Average.....	\$6.57	\$6.60

The foregoing shows that after a decline of something like 32 per cent. in little less than three years, the average price of common plates has become steady during the summer months. The demand has indeed been quite satisfactory throughout these months, and the large imports have been readily taken, so much so that a month ago the interior had become well stocked. Western dealers are expected soon to recommence their purchases for the winter trade, however. The stock at the seaboard is light at present, but dealers here will now also begin to provide for the requirements of a larger consumption. The imports into the port of New York alone during the first eight months of the year have been 749,000 boxes, against 581,000 last year. In neighboring ports the increase must have been still larger, judging from the exports from Liverpool alone:

EXPORTS FROM LIVERPOOL FIRST 7 MONTHS.						
To ....	N. Y. Boxes	Phila. Boxes	Bost'n Boxes	Balt. Boxes	Other Ports. Boxes	Total. Boxes
1877.....	437,876	156,948	137,840	128,155	90,665	951,047
1876.....	457,591	114,442	87,394	84,159	59,657	803,448
1875.....	520,601	113,933	139,548	84,165	59,411	909,658
1874.....	479,395	95,108	76,370	37,324	37,051	736,245

The rapidly growing import of tin plates from Liverpool into Philadelphia and Baltimore will be noticed. The general English export has been the following:

ENGLISH EXPORTS: HALF-YEAR ENDING JUNE 30—TO ALL COUNTRIES.

	Boxes.	Boxes.
1872.....	1,141,761	1,282,385
1873.....	1,257,343	1,438,607
1874.....	1,086,103	1,448,557

TOTAL EXPORTS DURING 12 MONTHS.

	Boxes.	Boxes.
1872.....	2,083,451	2,448,086
1873.....	2,150,477	2,400,038
1874.....	2,143,408	

The preceding statistics show that the quantity exported during the first six months of the current year has been 214,432 boxes in excess of the average of the six years, including the present. But notwithstanding



this fact, and despite the reduced working time still adhered to in England, they seem to be making more than home consumption and export can absorb with ease; hence it is apprehended that prices there may have to give way a little, unless the fall business here should be beyond expectation brisk and call for a large import. A further decline in British prices would, of course, cause a corresponding one here.

#### Nails from Old Rails.

There has been considerable crimination and recrimination in the West in regard to the use of old rails in the manufacture of nails. Some weeks since we republished from the *Wheeling Intelligencer*, with credit, a statement regarding their use in that city. In a Pittsburgh paper, of recent date, there appeared a report of an interview with a Wheeling manufacturer, in which it was stated that the Pittsburgh mills were using old rails. We have been at some trouble to get at the facts in the case, and are informed, by parties in whose word we place the utmost confidence, that old rails are not used in the manufacture of nails at either Wheeling or Pittsburgh. The only truth in the reports seems to be that after the reported success of General Powell, at Belleville, Ill., in the use of old rails, some experiments were made in these cities, but they were so unsatisfactory that they were not continued. A valued correspondent at Wheeling states that but three kegs were made in that city. In Pittsburgh it was found that rails were so uneven that even with the best selection it was impossible to make a nail that any manufacturer would be willing to put his brand upon, and not a keg was made for the market. We make this explanation in justice to the manufacturers of these two cities, as we republished the article referred to.

The approaching English trade congress, to be held on the 17th of the present month, has undertaken a rather heavy programme of business. It evidently expects to influence no inconsiderable amount of legislation during the next session of Parliament. The following is the work to be done by it: 1. To amend the law of compensation to workmen in cases of accidents, so that workmen or their families may recover from an employer in the event of injury or death from accidents due to negligence. 2. To secure the passing of the government bill to amend and consolidate the laws relating to factories and workshops. 3. Reform of the administration of justice. 4. The codification of the criminal laws. 5. Reform of the jury law, by lowering the qualification for jurors, so as to admit a large number of workmen to the discharge of the duties of jurors, and provide reasonable payment for loss of time. 6. The extension of the Employer and Workmen act, 1875, to English seamen while in British waters. 7. Reform of the patent law. 8. Abolition of imprisonment for debt. 9. Compulsory certificates of competency for men in charge of steam engines and boilers.

Besides these there are several other subjects laid down for discussion. Among them are co-operation and its relation to trades unionism; representation of labor in Parliament; overtime and apprentices; conciliation and arbitration in trade disputes; and what should be the basis upon which an arbitration should decide the question of an advance or a reduction of wages. There will also come up the question of altering the constitution of the Parliamentary Committee by extending its sphere of usefulness.

With the best of presiding officers we think this is a programme which will require for its satisfactory and conclusive discussion about seventy-five years.

The workmen very rarely think deeply enough to get at the true philosophy of strikes, but one of the railroad engineers at Syracuse, N. Y., seems to have gone to the bottom of the matter. When urged to strike he is said to have replied as follows: "Suppose we should strike now and be out of work a month, and at the end of that time the company should give in and let us have 'but 10 per cent. advance—how much would we make on that deal? During the month of strike and idleness I should lose 'over \$30 to start with. Some might think 'that a high figure, so cut it down to \$60. 'How long will it take me to make up that '\$60 which I have lost by the strike by 'recovering the 10 per cent. advance which 'the strike might gain for me? O, I've figured this thing all out. I should be just 40 'weeks, or nearly a whole year, trying to 'make up what I lost by one month's idleness! 'That is on the supposition that we 'come out ahead. If we don't come out 'ahead, striking time is a dead loss, and if 'we do come out ahead, it takes nearly a 'whole year before I make up what I lose. 'I say, excuse me from striking!" We commend this very simple and direct line of reasoning to the consideration of workmen generally.

We learn that the Franklin Institute is to purchase a dynamo-electric machine capable of generating electricity to furnish light to the extent of 1200 candle power. The society, we believe, intends to use the machine to experiment with such electric lights as may be offered for trial. There are many questions concerning the use of the electric light industrially that a series of judicious experiments will answer. The result of

these experiments cannot fail to be immensely valuable to industrial science. The electric light has already been used in a practical way in France for lighting a depot and a railway yard. The reports give glowing accounts of the success of the apparatus, but we hear that this success is not so perfect as could be wished, and very serious difficulties must be overcome before the machines can be generally introduced. At one time the English gas companies were very considerably alarmed lest the electric light should entirely supersede the use of gas for illuminating purposes, but with a better knowledge of the working of the machine this alarm has passed away. A good and reliable electric candle or its equivalent is much needed, and many inventors are at work upon the problem of producing one. It seems to be a possibility of the near future to use the dynamo-electric machine in the production of electricity for the illumination not only of streets but private houses, and at a cost far below that of any of the common means of lighting by the use of gas, oil, candles, etc.

We find the following very significant item in the *Pittsburgh Commercial*:

The chimney glass blowers will hold out against the use of the patent "crimper," and are encouraged in their strike from the fact that in Bellare, Ohio, the employers have acceded to the demands of the workmen, and have done away with the "crimper." The men here do not insist on throwing out the machine, but refuse to turn out any greater number of chimneys for a day's work than heretofore.

This is a new outbreak of the old war of "muscle against machinery." It frequently happens that the machine for the time being goes to the wall, but in the end the workman who fights is ground to powder. Machinery is too powerful, and can "hold out." Competition is too sharp and far-reaching in its effects, and if Pittsburgh is not allowed to use machinery manufacturing will prosper more in other localities. England has had numberless instances of flourishing trades utterly ruined by the narrow-minded, short-sighted policy of workmen who would not have machines brought into their trades.

#### CHINESE IMMIGRATION.

*Memorial to Congress from the Committee Appointed by the Last Legislature—A Powerful Summing up of the Question—The Social, Moral and Political Effect of the Evil Ably Discussed.*

At the last session of the Legislature Senators Raymond, McCoppin, Pierson, Donovan, Rogers, Lewis and Evans were appointed on the part of the Senate to take testimony in relation to the effect of Chinese immigration on the moral and social condition of this State, and to address a memorial to Congress, embracing the result of their investigation, and praying for such legislation as would seem to them to be needed. The Committee have concluded their labors, and the following memorial has been prepared and forwarded to Washington:

Under the authority of the resolutions we have inquired into the subject of Chinese immigration into the United States, and particularly into the State of California, and into the past, present and the probable future results of this immigration upon our people, and from the evidence adduced before us, whereof a report and argument is also herewith presented, we respectfully submit the following considerations:

The State of California has a population variously estimated at from 700,000 to 800,000, of which 125,000 are Chinese. The additions to this class have been very rapid since the organization of the State, but have been caused almost entirely by immigration, and scarcely at all by natural increase. The evidence demonstrates beyond cavil that nearly the entire immigration consists of the lowest orders of the Chinese people, and mainly of those having no homes or occupations on the land, but living in boats on the rivers, especially those in the vicinity of Canton.

This class of the people, according to the castes into which Chinese society is divided, are virtually pariahs—the dregs of the population. None of them are admitted into any of the privileges of the orders ranking above them; and while rudimentary education is encouraged and even enforced among the masses of the people, the fishermen and those living on the waters and harbors of China are excluded by the rigid and hoary constitutions of castes, from all participation in such advantages.

It would seem to be a necessary consequence flowing from this class of immigration that a large proportion of criminals should be found among it; and this deduction is abundantly sustained by the facts before us, for of 545 of the foreign criminals in our State Prison 193 are Chinese—nearly two-fifths of the whole—while our jails and reformatories swarm with the lower grade of malefactors.

The startling fact also appears that the actual cost of keeping these 193 State prisoners alone exceeds by \$12,000 per annum the entire amount of revenue collected by the State from all the property assessed to Chinese.

But the criminal element in the Chinese population is very much greater than the figures above given would indicate, for conviction for crime among this class is extremely difficult. Our ignorance of the Chinese language, the utter want of comprehension by them of the crime of perjury, their systematic bribery and intimidation of witnesses, and other methods of baffling judicial action, all tend to weaken the authority of our laws and to paralyze the power of our courts.

A graver difficulty still is developed in the existence among the Chinese population of secret tribunals, unrecognized by our laws, and in open defiance thereof, an *imperium in imperio*, that undertake and actually administer punishment, not unfrequently of death. These tribunals exercise the power of levying taxes, commanding masses of

men, intimidating interpreters and witnesses, enforcing perjury, punishing the refractory, removing witnesses beyond the reach of process, controlling liberty of action, and preventing the return of Chinese to their homes in China. In fact, there exists among us tribunals and laws alien to our form of government, and which practically nullify and supersede both national and State authority.

The Chinese females who immigrate into this State are, almost without exception, of the vilest and most degraded class of abandoned women. The effect of this element in our midst, upon the health and morals of our youth, is exhibited in the testimony. Its disgusting details cannot, for obvious reasons, be enlarged upon in this memorial. These women exist here in a state of servitude beside which African slavery was a beneficent captivity. The contracts upon which their bodies are held, under this system, are fully explained and set out in the evidence, and, we submit, more than sustain what might otherwise be regarded as an extravagant deduction.

The male element of this population, where not criminal, comes into a painful competition with the most needy and most deserving of our people—those who are engaged, or entitled to be engaged, in industrial pursuits in our midst. The common laborer, the farm hand, the shoemaker, the cigar-maker, the domestic male and female and workmen of all descriptions find their various occupations monopolized by Chinese labor, employed at a compensation upon which white labor cannot possibly exist. Amelioration of this hardship might be possible to a limited extent if the proceeds of this labor were invested in our State, distributed among our people, and made to yield a revenue to the government for the protection afforded by it to this class of our population. But the reverse is the fact, for of six hundred millions of taxable property in the State in the last fiscal year, but one million and a half was assessed to Chinese. Thus one-sixth of the entire population pays less than one-four-hundredth part of the revenue required to support the State government.

And, in addition to this alarming fact, we find that, of the one hundred and eighty millions, if not more, earned by them during their continuance here, the whole is abstracted from the State and exported to China; thus absolutely impoverishing instead of enriching the country affording them an asylum. The sharp contrast between the results of that kind of labor and of white labor, with its investment in homes, its accumulation of wealth and additions to our revenue must be obvious, even to a partial mind. Fertile lands that scarcely require tillage to produce a harvest are lying idle, partly because the laborer that would purchase and improve them can earn nothing above a bare support, where-with to buy, while the Chinese, who can by their habits of life practically subsist on nothing and save money, export their savings instead of here accumulating property. What the \$180,000,000 of solid gold shipped from California to a foreign country would produce if retained here by white labor and invested in the soil, in the homes and firesides of our own race, requires no illustration or argument. California, instead of being a State of cities, might be a State of prosperous farms; instead of being in a condition (considering her extraordinary natural advantages) of wonderful and healthy progress, we find her so retarded in her growth as to amount almost to retrogression.

It is a trite saying, however, that competition in labor is healthful. True; but not between free and slave labor, and the Chinese in California are substantially in a condition of servitude. Ninety-nine one-hundredths of them are imported here by large companies under contracts to repay to the importers out of their labor the cost of their transportation and large interest upon the outlay, and these contracts frequently hold their subjects for long periods. During the existence of these contracts the Chinese are to all intents serfs, and as such are let out to service at a miserable pittance to perform the labor that it ought to be the privilege of our own race to perform. Even were it possible for the white laborer to maintain existence upon the wages paid to the Chinese, his condition nevertheless becomes that of an abject slave, for grinding poverty is absolute slavery. The vaunted "dignity of labor" becomes a biting sarcasm when the laborer becomes a serf.

Irrespective, however, of this slavery by contract, the Chinese who inundate our shores are, by the very constitution of their nature, by instinct, by the traditions of their order for thousands of years, serfs. They never rise above that condition in their native land, and by the inexorable decrees of caste, never can rise. Servile labor to them is their natural and inevitable lot. Hewers of wood and drawers of water they have been since they had a country, and servile laborers they will be to the end of time. Departure from that level with them is never upward; the only change, apparently, is from servitude to crime.

The pious anticipations that the influence of Christianity upon the Chinese would be salutary have proved unsubstantial and vain. Among one hundred and twenty-five thousand of them, with a residence here beneath the elevating influence of Christian precept and example, and with the zealous labors of earnest Christian teachers, and the liberal expenditure of ecclesiastical revenues, we have no evidence of a single genuine conversion to Christianity, or of a single instance of an assimilation with our manners or habits of thought or life. There are few, painfully few, professing Christians among them, but the evidence confirms us in asserting that, with these, the profession is dependent, to a great extent, upon its paying a profit to the professor. Those Christians who hailed with satisfaction the advent of the Chinese to our shores, with the expectation that they would thus be brought beneath the benign influence of Christianity, cannot fail to have discovered that for one of them that had professed Christianity a hundred of our own youth, blighted by the degrading contract of their presence, have been swept into destruction.

Neither is there any possibility that in the future education, religion or the other

influences of our civilization can effect any change in this condition of things. The Chinese in California are all adults. They are not men of families. The family relation does not exist here among them. Not one in a thousand is married, and in addition, their practices of opium eating are practically destructive of the power of procreation. So that whatever improvement might otherwise be anticipated from instilling into the comparatively unformed and receptive minds of a young and rising generation the educational and religious maxims that control our own race, is thus effectually precluded.

Above and beyond these considerations, however, we believe, and the researches of those who have most attentively studied the Chinese character confirm us in the consideration, that the Chinese are incapable of adaptation to our institutions. The national intellect of China has become decrepit from sheer age. It has long since passed its prime and is waning into senility. The iron manacles of caste which prevail in that empire are as cruel and unyielding as those which chain the sudras in Hindostan to an hereditary state of pauperism and slavery. As an acute thinker has sagaciously observed, the Chinese seem to be antediluvian men renewed. Their code of morals, their forms of worship and their maxims of life are those of the remotest antiquity. In this aspect, they stand a barrier against which the elevating tendency of a higher civilization exerts itself in vain. And in an ethnological point of view, there can be no hope that any contact with our people, however long continued, will ever conform them to our institutions, enable them to comprehend or appreciate our form of government, or to assume the duties or discharge the functions of citizens.

During their entire settlement in California they have never adapted themselves to our habits, modes of dress or our educational system. They have never learned the sanctity of an oath, never desired to become citizens or to perform the duties of citizenship, never discovered the difference between right and wrong, never ceased the worship of their idol gods or advanced a step beyond the musty traditions of their native hive. Impregnable to all the influences of our Anglo-Saxon life, they remain the same stolid Asiatics that have floated on the rivers and slaved in the fields of China for thirty centuries of time.

In view of all this, we inquire what are the benefits conferred upon us by this isolated and degraded class? The only one ever suggested was "cheap labor." But if cheap labor means white famine, it is a fearful benefit. If cheap labor means not only starvation to our own laborers, but a gradual yet certain depletion of the resources of our State for the enriching of a semi-civilized foreign country, it is a benefit hitherto unknown to the science of political economy. If cheap labor means servile labor, it is a burlesque on the policy of emancipation. And if this kind of cheap labor brings in its train the demoralization consequent upon the enforced idleness of our own race, the moral degradation attendant upon the presence in our midst of the most disgusting licentiousness, and the absolute certainty of pestilence arising from the crowded condition and filthy habits of life of those who perform this so-called cheap labor, it were well for all of us that it should be abolished.

We thus find one-sixth of our entire population composed of Chinese coolies, not involuntary but by the unalterable structure of their intelligent being voluntary slaves. This alien mass, constantly increasing by immigration, is injected into a republic of freemen, eating of its substance, expelling free white labor, and contributing nothing to the support of the government. All of the physical conditions of California are in the highest degree favorable to their influx. Our climate is essentially Asiatic in all its aspects, and the Federal government, by its legislation and treaties, fosters and promotes the immigration. What is to be the result? Does it require any prophetic power to foretell? Can American statesmen project their vision forward for a quarter of a century and convince themselves this problem will work out for itself a wise solution? In that brief period, with the same ratio of increase, this fair State will contain a Chinese population outnumbering its freemen. White labor will be unknown, because unobtainable, and then how long a period will elapse before California will, may must, become essentially a State with but two orders of society—the master and the serf—a lesser Asia, with all its deathly lethargy?

Or, on the other hand, may we not foresee a more dire result? Is it not possible that white labor, unable to compete with these foreign serfs, and perceiving its condition becoming slowly but inevitably more hopelessly abject, may unite in all the horrors of riot and insurrection, and defying the civil power extirpate with fire and sword those who rob them of their bread yet yield no tribute to the State. This is a frightful possibility, but we have within a brief period witnessed its portents, and had it not been for the untiring vigilance of the conservative portion of our people, we might have seen not only the Chinese quarters but our cities entirely in ashes and families homeless, and the prosperity and good fame of California shattered and disgraced.

It is no answer that these uprisings are the work of the criminal classes only; they have a deep root in the sense of self-preservation. Throughout the length and breadth of California the white laborer knows the effect of this grinding competition. He reads it not in books, nor in the press; he learns it from no lips; he feels it in the empty pocket, the hopeless search for work and the gaunt want that sits at his hearth.

The duty devolves upon us to suggest a remedy for the suppression of this immigration.

The Chinese now here are protected by our treaty obligations and laws, and that they will continue to receive that protection the people and government of this State will be responsible. If further immigration is prevented they will gradually return to their own country, and the occupations in which they are now engaged will be supplied with laborers and immigrants of our own race. The temper of the people of California is such that the employment of Chinese will be,

as it has to a considerable extent been discouraged, and this will effectually compel their departure.

As to future immigration, neither a total nor partial abrogation of the Burlingame treaty will afford relief. The mass of, indeed the entire immigration, comes from the port of Hong Kong, a British colony. No alteration in our treaty stipulations with China could have the slightest effect upon the passenger trade of that port.

The British colonies of Australia have, like us, suffered under the incubus, and have recently endeavored by hostile legislation, and in some instances by force, to effect the exclusion and obstruct the further ingress of Chinese. Those agitations, coupled with the earnest and uniform policy of Great Britain of suppressing any traffic resembling the slave trade, convince us that an appeal to that country would lead to the desired result. Indeed, we may well assume, in view of the amicable relations existing between the English cabinet and the people of the United States, that in the absence of any urgent reasons addressing themselves peculiarly to Her Majesty's government, it would upon proper diplomatic representations cordially co-operate with our own government in arriving at a satisfactory remedy.

With the Chinese government there need be no difficulty. As will appear by the report, that government is opposed to the emigration of its people, and in our judgment, founded upon reliable evidence, would readily consent to a modification of existing treaties; and for this reason, also, such modification would not necessarily disturb, in any manner, our commercial relations with China.

We would, therefore, most respectfully suggest as the means of a final solution of this grave and ever-increasing difficulty, first, an appeal to the government of Great Britain to co-operate with our own government in the absolute prohibition of this trade in men and women; and second, the joint and friendly action of the two countries with the Empire of China in the abrogation of all treaties between the three nations permitting the emigration of Chinese to the United States.

And in the meantime we earnestly recommend legislation by Congress limiting the number of Chinese allowed to be landed from any vessel entering the ports of the United States to, say, not more than ten.

This policy would in a great degree tend to a redress of the grievances that now so sorely afflict our State and threaten to overshadow her prosperity.

And your memorialists will ever pray, etc. Adopted at a meeting of the committee held in the city of San Francisco, August 13th, 1877.

The committee with this memorial will transmit to Congress an elaborate argument, supported by selections from the testimony of reliable witnesses. The argument will shortly be printed for circulation.

#### Splicing Iron and Steel Wire.

The *Coal Trade Journal* gives the following account of a new method of splicing iron and steel wire:

In manufacturing guides for coal and other pits, colliery ropes, telegraph wire, telegraph cables and fencing, and in other manufactures it is often necessary, in order to obtain wires of the required length, to join two or more lengths of wire together, end to end, and this is ordinarily done by the process of welding. But in welding together wire of iron or steel the metal is frequently so injured during the welding process that the junction formed is very weak, and the wire is liable to break at the welded part. The object of an invention of Mr. W. Hibell, of Birmingham, England, is to produce wires of iron and steel of any required length, having at the joined part a strength equal to any other part. He cuts away a portion of the end of each wire, so as to give it a semi-cylindrical figure, the cutaway portion extending about 1 inch from the end of the wire. The extreme ends of the wires may terminate in planes at right angles to the axis of the wire, but he prefers to incline each end so as to give it a wedge shape, the thin end of the wedge terminating in the axis of the wire. When he thus inclines the ends of the wire, he makes the shoulders terminating the cutaway parts of an undercut figure, so that the wedge-shaped end of one wire, when the ends of the two wires are fitted together, shall engage with the undercut shoulder of the other wire. The ends of the wires thus shaped he connects together by the process of brazing or hard soldering, and the junction formed has a strength equal to that of any other portion of the wire. In wires of small diameter he prefers to give to the ends to be joined a plane, making but a small angle with the plane in which the axis of the wire is situated. The two plane inclined ends are joined by hard soldering or brazing. In practice he has found that planes of about one inch in length formed on the wires answer very well.

The address of Prof. E. C. Pickering, as Vice-President of the American Association, and President of Section A (mathematics and physics), was read by proxy, as he did not attend the Nashville meeting. The address was an argument in favor of the endowment of scientific research. Its most interesting portion was the description of a suitable building and arrangements for a physical laboratory where experiments might be made to carry out scientific researches. Prof. Pickering gave elaborate details of his project, and pointed out the numerous advantages that might be expected to result when these facilities were afforded to investigators. The plan includes the appointment of a presiding officer and a staff of assistants. The "castle in Spain" of Prof. Pickering is not a thing of beauty. He says: "The building itself is large but low, and resembles one or more blocks of two-story dwelling houses. No more common mistake is made than in wasting the money which should be used for equipment on architectural effect. It is useless to hope for architectural beauty in this building."



## The Paris Exposition of 1878.

A correspondent of the Manchester (Eng.) *Examiner* writes as follows of the coming French Exhibition, from which, owing to the inexorable apathy of our government, American exhibitors are likely to be excluded:

During the last three months, which have elapsed since the *coup d'état* of the 16th of May, the Parisian public, especially that portion of it engaged in commercial pursuits, have been considering with some anxiety what effect present or future political complications are likely to have on the fate of the great Exhibition, which, it is hoped, is to draw all the world to Paris in the spring of next year. The anxiety is not unfounded. Every day it becomes more apparent that the course pursued by the government has inflicted a blow on French trade from which it is not likely to recover, at least till after the elections; possibly not then. As it is also certain that the Exhibition will have to depend chiefly on France and England for its success, since neither Germany, Russia, Turkey, nor Greece will, so far as their intentions are yet known, take any part in it, the continuance of the present abnormal depression in France must necessarily deprive the undertaking of a great deal of the support it would otherwise receive in the country. There are, indeed, not wanting prophets, both in the press and in political circles, who plainly assert their convictions, not only that the Exhibition will not take place at all, but that the government has already such a contingency in view, notwithstanding the sanguine official report just issued. This belief, it should however be said, is chiefly current among those who fear that whatever may be the result of the October elections the government will not recede from the position it has taken up, and that a foreign war is a very possible outcome of their policy. The question of course need not here be discussed, though one circumstance may be mentioned which in some degree seems to corroborate the idea. Whatever may be the reason, it is clear that slow progress is being made with the colossal works in the Champ de Mars and the Trocadero. As the Exhibition is to open in May next, the chief part of the building ought certainly to be completed at least a month or six weeks beforehand, so as to allow time for the arrangement of the articles to be exhibited. But at the present time it appears as if the work could not be nearly finished within the date assigned for its completion. Speaking broadly, it may be said that at least 7000 or 8000 workmen would be required to get the buildings and gardens ready in time, while it is doubtful whether there are at present more than a third of that number engaged, and immense quantities of stone and other material are lying idle for want of hands to deal with it. The matter may be one of no ultimate moment, for it is quite possible that a sufficient number of workmen may yet be put on; but as the winter is by no means a favorable season for building operations in Paris, the apparent loss of time and opportunity in the summer naturally excites suspicion in the minds of those predisposed to take a gloomy view of the matter.

Nevertheless, backward as the works are compared with the time still at disposal, they are so far advanced as to give a very clear idea of what their appearance will be when finished. The whole scheme projected by MM. Davioud and Bourdais, the architects, is one of unexampled magnificence even in this city of palaces, and in the minds of most visitors the Exhibition buildings will probably excite as much interest, and even astonishment, as the Exhibition itself. The first and most important position is that of the Palais du Trocadero, which stands on the high ground from which it takes its name, and overlooks a great part of Paris. The palace is built of white stone, and forms an immense crescent, sweeping down toward the Champ de Mars, the total length from the great pavilion at either extremity being nearly 450 yards. The two arms of this crescent are united in the middle by a rotunda of gigantic proportions, the dome of which is to be surmounted by a colossal gilt figure of an archangel, and from the junction of the ends of the crescent with this cathedral-like building spring two square towers, each over 100 feet high, and both resembling somewhat the minarets of an Oriental mosque. From each of these towers electric lights will flash over Paris at night. The chief entrance to the palace will be at the back, in the Trocadero, but this side of the building is quite plain compared to that which overlooks the Champ de Mars. Passing through this entrance we come into the hall of the rotunda, the size of which may be judged from the fact that it is to hold more than 10,000 persons on the occasions of concerts, prize distributions, etc., which are to be held there. Through this hall we reach the outside facade of the rotunda, which forms a noble arcade continued along both arms of the crescent, and forming a splendid promenade. Standing in the middle of this arcade we have immediately beneath us the cascade, which is to be one of the marvels of the Exhibition. Issuing from a great cavern in the base of the building, this cascade will have a fall of nearly 60 feet over a series of steps extending its entire length of no less than 215 yards, and as it has also a breadth of about 60 yards it may easily be imagined how great will be the volume of water poured over the slope. At the bottom the water will fall into an enormous basin, which will serve as a reservoir for the whole of the water required in the other parts of the Exhibition grounds. From our point of vantage we also command a view of the gardens of the palace, sloping downward, the eminence on which the palace stands being nearly 50 feet above the river bank. A finer panorama than that presented cannot easily be conceived. Immediately beneath us, on the other side of the river, is the Palace of the Champ de Mars, which we shall describe presently. Further away we see some of the chief public buildings of Paris—the glittering dome of the Invalides, the Place de la Concorde, the Louvre, and the ruins of the Tuilleries, and further away still the Heights of Montmartre, the Buttes Chaumont, and so beyond the fortifications for a distance of

# AMERICAN SCREW CO.,

Providence, R. I.

Manufacturers of

## IMPROVED Gimlet Pointed Wood Screws, Patented May 30, 1876.

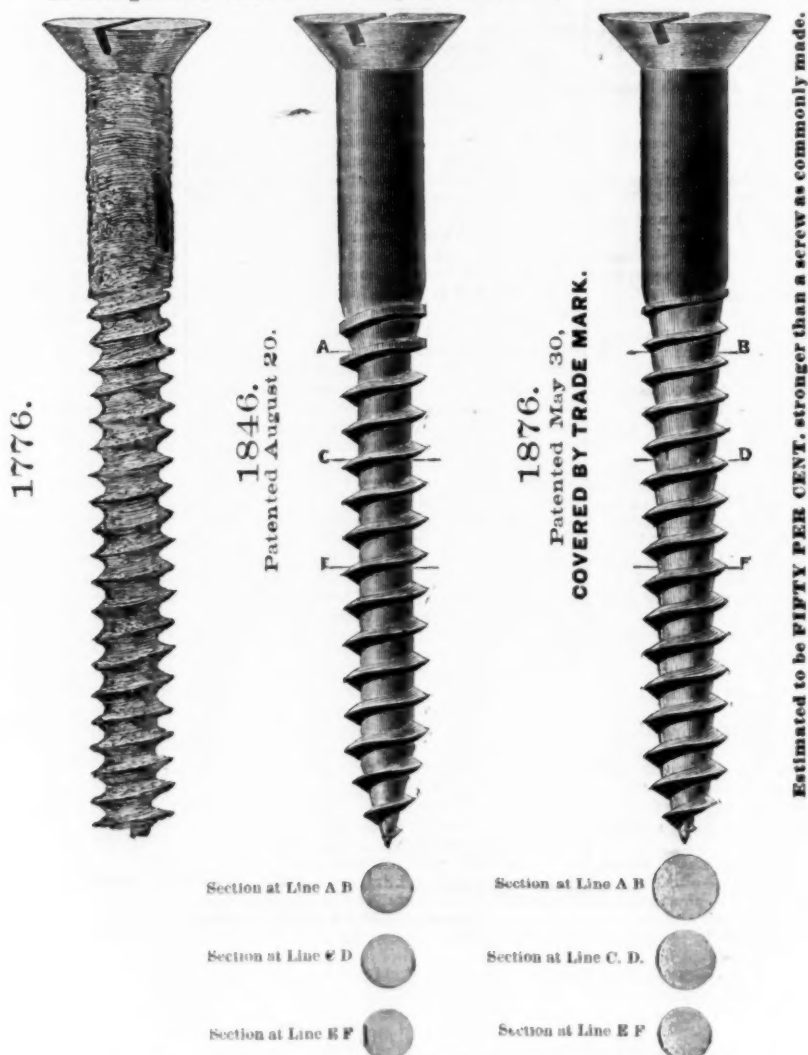


After forty years' experience we offer to the trade our Centennial Screw, patented May 30, 1876, as the best we have ever known.

The method of manufacturing is also patented, and we are changing our machinery as fast as possible, to manufacture the improved article only. To introduce them, they will be sold at same price as the old style screw.

The new screws will be packed in manila colored boxes with new label covering end of box, and enlarged figures showing plainly contents.

To distinguish this screw we have adopted a trade mark, which is also secured to us.



The above drawings show the progress of screw making from the old blunt point to style now adopted.

Experience has shown that the weak point of screws, as formerly made, is at the heel of the thread, where all the strains of forcing the screw into the wood naturally concentrate.

To avoid the sharp angle existing in the old style of screws has been the aim of all manufacturers, but every expedient hitherto adopted has proved as objectionable as the evil complained of.

It will be seen in our new screw that not only is the sharp angle avoided, but the strength very much increased, as illustrated above. See sections at lines.

## CLAIM.

"A Pointed Wood Screw having the outer periphery of the thread upon its body cylindrical, while a portion of the body below the thread and near the neck is conical, the remainder of the body to the point being cylindrical, and yet having all the thread brought to an edge of a constant angle, without jogs in the paths between the threads, substantially as described."

15 or 20 miles round the horizon. One can understand why the first Napoleon should have fixed on this height for the site of the building which was to have been one of the most enduring monuments of his Empire—the Palais du Roi de Rome. The project which he could not realize is being accomplished by the great-grandsons of that generation. Only the Palais du Roi de Rome would have represented the triumphs of war, and the Palais du Trocadero symbolizes the victories of peace.

It is not easy to characterize in precise terms the architectural style of this magnificent structure, of which we have described the salient details. It is in fact half Moorish, half Grecian, combining some of the most graceful features of both. Light, airy, elegant, and yet massive in proportion to its size, the design of MM. Davioud and Bourdais will give to future generations no mean idea of the architectural tastes of the France of the nineteenth century. This part of the Exhibition buildings is, as we need hardly repeat, intended to be permanent, though to what purpose it may be turned hereafter time only can decide. During the Exhibition it will be used in the first place as the headquarters of the commission, and also for musical festivals, conferences, and reunions, as well as agricultural, horticultural, maritime, sanitary, and other similar exhibitions; the four smaller pavilions which divide the two sides of the semicircle being intended in part for art galleries, though the chief portion of the artistic exhibition will be on the other side of the river.

Leaving the Trocadero, and crossing the Pont d'Iena, we pass into the Champ de Mars, where the chief portion of the Exhibition will be held. It was at first intended to make a covered gallery over the Seine, thus practically uniting the two grounds. This design has, however, been abandoned, and visitors will pass from one to the other by the Pont d'Iena, which is to be temporarily widened to accommodate the traffic. The Palace of the Champs de Mars is naturally very different from the other, for it is only intended to serve a particular purpose, and will be demolished as soon as the Exhibition is over. M. Hardy, the architect, has constructed his plans pretty much on the same principle as those of the Exhibition of 1867. The palace, which, with its gardens, occupies the whole of the Champ de Mars, forms an immense parallelogram, 760 yards in length and 360 in breadth. Each side of this parallelogram is a gallery, the four corners being formed by large pavilions. Seven aisles, six of which run the whole length of the building, occupy the ground thus inclosed. The seventh, or rather the center aisle, is cut in two in the middle, so as to allow space for a large ornamental open square, and in addition two aisles traverse the whole breadth of the inclosure, these again being subdivided by large ornamental arches, which form two sides of the open square. The center aisle of which we have spoken is joined to the others, above and below the square, by smaller passages or galleries. The front entrance of the Palace is in the Quai d'Orsay facing the Trocadero, the Avenue de la Bourdonnaye forming the left side, the Avenue de Suffren the right, and the back abutting on the Avenue de la Motte Piquet, opposite the Ecole Militaire. This is the portion of the works which is in the least forward state, and though the erection of an edifice of iron, glass and wood, of which the palace is being built, does not take so much time as one of stone, still the amount of labor yet required is enormous, and the staff of men at work seems ridiculously inadequate to cope with it. The building is to be devoted to objects of art, industry and science, everything being so arranged that the visitor will be able to study the whole of the productions of each particular country separately, and passing from one to the other easily compare their respective progress either in the arts of peace or of war. The facades at the entrance to each section will be built in the style of architecture peculiar to the country to which the section is devoted, so that from an architectural point of view the visitor will be able to make the tour of the world not only in eighty days but eighty minutes. French architecture will be shown more in detail, embracing all styles from the Gallo-Roman down to the present day. Further detail is at present unnecessary. Suffice it to say that nothing that may be considered as representative of any country exhibiting, either in an artistic, social or industrial sense, has been left out of the elaborate scheme prepared by the commission.

What the success of the Exhibition is likely to be, apart from the considerations indicated at the commencement, may be gathered from the fact that no less than 35,500 applications for space have been received from France alone, while in 1867 the total number of exhibitors was only 19,000. Most of these applications it is true were sent in before the 16th of May, and circumstances will not improbably necessitate a great many withdrawals. The fact, however, indicates the interest taken by the French people in the undertaking, and will explain the prevalent anxiety about its possible untoward fate. England will also occupy a very prominent position, the names of 2000 English exhibitors having already been received, and neither Italy nor Belgium are backward, so that if the Exhibition is once opened there is no chance of its failure from want of attraction. In conclusion, we may mention that the commission has decided that the jury for awarding medals and prizes shall consist of 650 members, among whom 350 will be Frenchmen and the rest foreigners, the first being appointed by the Ministerial Commissions, and the foreign jury by the government of each country represented. The sum which has been allotted for prizes is 1,500,000 francs, and the medals will be appropriated in the following manner: 17 for fine arts, 100 chief prizes and supplementary medals for the departments of industry and agriculture, together with 1000 gold medals, 4000 silver, 8000 bronze, and an equal number of "honorable mentions."

Brinly, Miles & Hardy, plowmakers, Louisville, Ky., have completed their two new brick warehouses, 55x142, two stories, and 42x100, one story, respectively. They are running full force now.

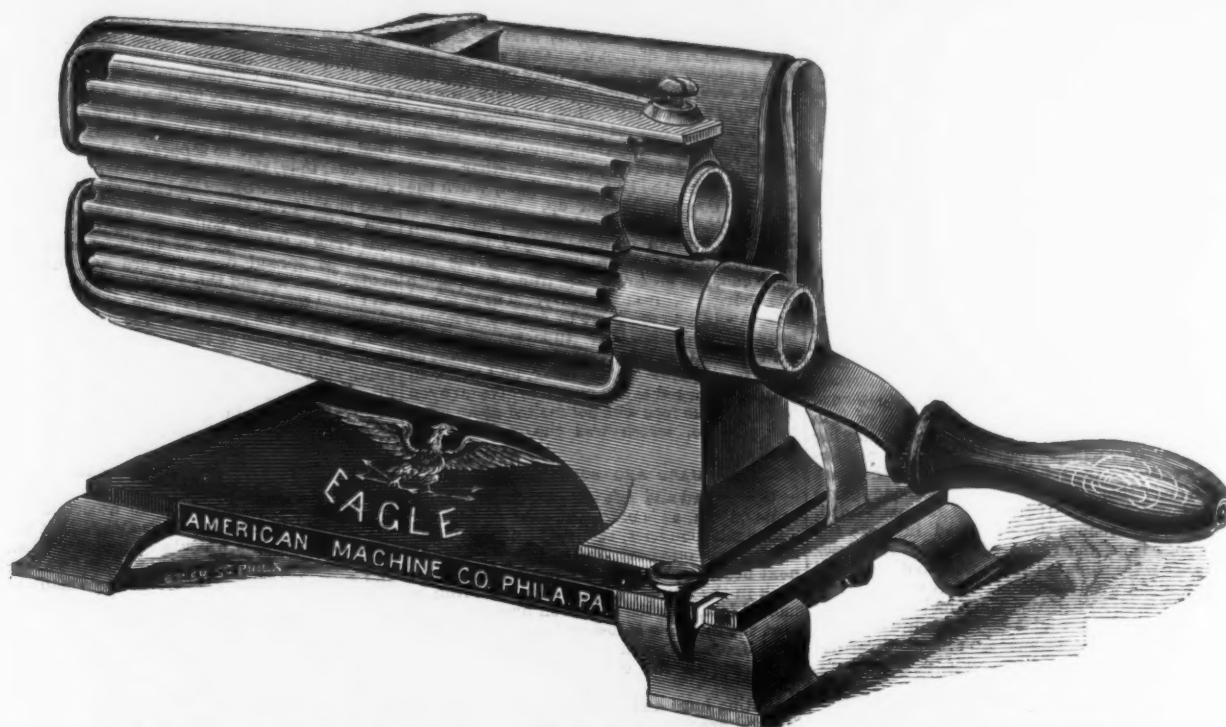


# THE AMERICAN MACHINE COMPANY,

PHILADELPHIA, PA.,

Manufacturers of

## FLUTING MACHINES AND SIMILAR SPECIALTIES.



### THE EAGLE FLUTING MACHINE.

To meet the popular demand of a Fluter that combines the great practical advantages of a machine having corrugated Rolls with the cheapness of the Hand Fluter, we offered the "EAGLE FLUTING MACHINE" to the trade some three months ago, feeling convinced that it would fully meet this want, and are now free to confess that our expectations have been more than realized. The machine has smaller rolls and is lighter than the "Crown" (hence its lower price), but it will do quite as good work, and for moderate use prove equally as serviceable. Sizes (length of Rolls),  $3\frac{1}{2}$  inches, \$18 per dozen;  $5\frac{1}{2}$  inches, \$24 per dozen, less 5 per cent.; furnished with either No. 15 or No. 13 Rolls. Each Machine inclosed in a box, and supplied with a Clamp, four wrought iron heaters and a holder. Put up in packages of half a dozen.



### The Crown Fluting Machine.

This most popular Machine is offered to the trade at reduced rates. It retains all the prominent features of practical advantages and superior finish which have made it the leading Machine in the market.

Sizes (length of Rolls),  $4\frac{1}{2}$  inches, \$2.35 each; 6 inches, \$2.75 each; 8 inches, \$4.00 each. The Roll can be had with either 10, 12, 15, 18, 22, 26 or 30 flutes. Each machine packed in a separate box, with four wrought iron heaters and a pair of tongs.



## Practical Iron Founding.\*

BY EDWARD KIRK.

The foundryman cares little or nothing for a chemical analysis of iron, which merely shows the exact amount of different impurities it may contain; but the question that the foundryman asks is: What iron can I work, and how can I mix them so as to produce a good, clean, strong and cheap casting? This is a question that is almost impossible to answer, as it is impossible to give a complete vocabulary of all the impurities which iron may contain, with their effect upon the iron in different proportions, as these proportions may be varied in remelting and produce different results; and even if it were possible, the foundryman does not wish to go to the trouble of making a chemical analysis of every lot of iron he gets in to ascertain its impurities and to keep track of how it may be mixed with some other lot of iron. Little can be told by looking at an iron in the pig, whether it will run hard or soft when remelted and run into castings, or whether it will mix with another brand of iron. The foundryman or an expert may by actual tests become acquainted with all the iron and ores used in a certain locality, and by looking at the iron in the pig tell very nearly what it will do when run into castings; but the best expert in the country can tell little or nothing about an iron that he has not been accustomed to working, and he will often be deceived in those he has been accustomed to by merely looking at the iron in the pig. True, he may make a good guess, and he may tell whether an iron will run extremely hard or soft, but that is all that can be told by the looks of an iron in the pig.

It is impossible to qualify the various kinds of pig iron brought into the market by local terms and marks. It would not, after all, be of any use, because the furnacemen may change their ores or their mode of charging the stock, and change the product of the furnace from a No. 1 iron to No. 2, or even No. 3 iron, which makes a great difference in its application in foundries; or a furnace may change the quality of its iron without any change of the ores, and without any apparent cause for the change in the quality of iron. When operating at Lewisburg, Pa., last spring, I found a lot of pig iron that was made at the Dry Valley Furnace, Pa. This iron, when remelted and run into a cylinder head that was nearly 2 inches thick, was so hard that it could not be drilled, yet the iron in the pig was of a dark gray color, with a large open crystal, and to all appearance was a No. 1 soft foundry iron. This iron was made from the same ores that the furnace had been using for years. In making a No. 1 foundry iron, no change had been made in the mode of stocking the furnace, and there was no apparent cause for the change in the quality of the iron. This furnace, after it had been in blast for a short time, got to working so badly that it became necessary to blow it out. It was then found that when putting the furnace in blast it had scaffold on one side, which was the cause of the hard iron. If a blast furnace, with the fire only on one side of it, will change the nature of iron as this furnace did, then a cupola, with the fire or the blast all on one side of it will change the nature of iron when remelted. I have seen two cupolas melting the same iron, and one produced good soft, strong castings, and the other produced hard or brittle castings. I have always found that the cupola that produced the hard or brittle castings either had the blast all on one side of it, or that the fire was not burnt up evenly, and that the stock was not charged regularly.

Cast irons admit of a division into three classes and seven grades. The three classes are: The red-short, the cold-short and the neutral iron. The seven grades are the seven qualities or seven numbers of iron, as No. 1, No. 2 or No. 3. Red-short iron is an iron that has no strength when red hot, and has a great deal of shrinkage. An extreme red-short iron will shrink as high as one-fourth of an inch to the foot. Red-short iron, when used for casting pipe on their end, will cause the body of the pipe to shrink down and leave the bowl of the pipe before the iron has thoroughly set, and when used in other castings, such as grate bars, it will tear off and form cracks in the corners while hot. It will cause chill cracks on the tread of a car wheel, but they are not deep and do not injure the wheel. Red-short iron may be either hard or soft, and is liable to go to extremes either way. It never breaks from shrinkage when cold.

Cold-short iron is an iron that has no strength when cold, and has very little shrinkage. It will resist very little strain, and if the patterns are the least bit out of proportion the casting will break from shrinkage after it is cold. It will cause stove plates to crack under the spews. Cold-short iron may be either hard or soft, and is liable to go to extremes either way, but it never breaks from shrinkage when hot.

Neutral iron is an iron between the extreme red-short and cold-short irons. It is made by mixing the red and cold short irons together. A neutral iron is the best iron for foundry purposes, and furnacemen who make a business of manufacturing foundry iron make it a point to mix their ores so as to make a neutral iron as possible. Yet in some localities one ore may be cheaper than another, and it may be used to excess, which may make an iron inclined to be either red-short or cold-short, yet not extreme either way. The foundryman that is using three different brands of iron may find at times that he has two brands of iron inclined to be cold-short and one brand inclined to be red-short. If these three irons are mixed in equal proportions they will make a casting inclined to be extreme cold-short. Yet one-fourth of the two brands and one-half of the third brand mixed together may make a neutral iron and a good strong casting; or by leaving out one of the brands, and using one-half of each of the other two brands, the same results may be attained. The only practical way to ascertain whether an iron is either red-short or cold-short is by actual tests in mixing and melting the iron in different proportions and testing the strength and shrinkage. A neutral iron should not shrink more than one-eighth of an inch to

the foot. Stove foundrymen should be careful to use as near a neutral iron as possible, and to change their brands of iron as little as possible, as the changes of iron often change the shrinkage, and will make trouble in mounting the stoves when much odd plate is kept on hand. When new brands of iron are introduced test bars should be made to ascertain the shrinkage, and the different brands of iron should be varied so as to keep the shrinkage as near alike as possible.

The same theory may be followed in mixing irons to make a soft iron, thus: Three brands of iron, mixed in equal proportions, may make a hard iron, while any two of the same brands, mixed in equal proportions, may make a soft iron. Tests were made last fall at Perry & Co.'s stove works in melting the three brands of iron, viz., Crane, Hudson and Jagger. These three irons were melted at the rate of 15 per cent. of Hudson to 85 per cent. of Crane and Jagger together. This mixture made a hard iron. One-third of each brand was then melted together and made a hard iron. One-half Hudson to one-fourth Crane and one-fourth Jagger were then tried, and the result was a hard iron. The Hudson and Crane were then tried together—one-half each—and made a good soft iron. The Hudson and Jagger were then tried together—one-half each—and made a good soft iron. The Crane and Jagger were then tried together—one-half each—and made a hard iron. Thus the Hudson would neutralize either the Crane or Jagger separately, but would not neutralize them when put together in any proportion.

Iron will combine with almost all of the 64 known elements, and these elements, combined with irons in different proportions, will destroy the affinity of one brand of iron for another, and foundrymen, in mixing their iron, will generally use equal proportions of all the brands of iron that they are using; thus one-half, one-third or one-fourth of each brand. If the castings come hard, they will reduce the No. 2 and increase the No. 1 iron, and I have often seen foundries that were using all No. 1 iron that were still troubled with hard iron. This was because they were using irons that had no affinity for each other, and would not unite so as to form a homogeneous iron; and throwing out the No. 2 iron gives only a temporary relief by the excess of carbon in No. 1 iron overcoming the non-affinity of the irons; and if the No. 1 iron happened to be a little poorer one day than another the iron was hard and uneven. I have often seen foundrymen that had one brand of iron in their yard that they had had on hand for years and could not use it, and perhaps the next foundryman that I would meet would be using that same brand of iron and could not get along without it. This was because the one foundryman was using other irons as a mix that had an affinity for that particular brand of iron, or the two foundrymen might be using the same iron as a mix and mixing them in different proportions, which produced different results. Two poor irons can often be mixed together so as to make a good iron, as is the case in mixing the extreme red-short and cold-short irons, which forms a neutral iron that is superior to either the red-short or cold-short irons for foundry purposes. In mixing irons I should recommend mixing them and varying the mixture by the local brands or marks, and not by the numbers of the iron. To make a good iron at least one-third of No. 2 should be used, and if all No. 2 irons can be used and make a soft iron, they will make a superior casting to all No. 1 iron. In melting iron, I should recommend melting it hot and as fast as possible. A quantity of molten iron should be kept in the cupola or in a large ladle, so as to give the different brands of iron a chance to mix. In most all the foundries at Wheeling, W. Va., the cupolas are never stopped in from the time the blast is put on until the bottom is dropped. A large ladle is set on trestles in front of the cupola in such a manner that the iron can run into it from the cupola and be poured out into the smaller ladles at the same time. The iron is all run out of the cupola as fast as it is melted and is mixed in the large ladle. I think this is a good way of mixing irons.

## HARD IRON.

Most every foundryman is troubled more or less with hard iron, especially if he is manufacturing light castings. Hard iron is sometimes caused by using a poor quality of iron in the first place, or poor fuel, or by using too much short iron or rusty scrap. The dampness in the sand bottom will cause the first iron to be hard. Iron boiling in a green ladle will be hard if run into light plates. Sand worked too wet, or rammed too hard, or sponged too much, will cause hard iron. Thus hard iron may be traced to a great many causes, but the principal cause of hard iron when good stock is used is the unscientific way in which cupolas are constructed and charged. It is a well-known fact that Nos. 1, 2 and 3 irons are made in a blast furnace from the same stock, the different grades of iron being caused by the different temperatures at which the ores are melted. If a large cupola is constructed with only one tuyere the blast cannot be forced into it so as to give an even temperature, or if the tuyeres are not placed at equal distances apart, or if they are so placed that one or two of them will take nearly all the blast and the balance of the tuyeres get little or none at all (as is often the case), the result will be an uneven temperature in the cupola and an iron hard and soft in spots. Cupolas are often charged with large coal in the bed, which forms large crevices between the lumps, through which the cold blast penetrates to the center of the cupola and strikes the hot iron as it drops through the coal and chills and hardens it. The bed is often put in without any regard to whether it is level or not on top when the iron is charged. The first charge of iron is thrown in and the second charge of coal in the same haphazard way. If the cupola is large and many gates or spews are used, they will probably all be found in a pile on the side of the cupola, where it is handy to throw them from where the man stands that shovels them in. The iron will invariably be higher just under the charging door than anywhere else. The coal or coke is thrown in, and, if small, will roll to the lowest place; thus having a large body of fuel in one place and little or none in another place. This uneven charging

ing makes an uneven temperature, and a hard and soft iron; or the iron may be charged even, and each charge leveled up, and the coal put in on it in large lumps (as is often the case), so that the small amount used will not more than half cover the iron, and will not separate the charges of iron properly. The result is the same as when the charges of iron are not leveled up—an uneven temperature, and hard and uneven iron. I have seen two stove plate foundries, in the same city, not more than two squares apart, melting the same brands of iron mixed in the same proportions, each using the same quality and same percentage of coal; and one foundry always had good soft iron, and the other one was always troubled with the iron running hard in spots. On examining the cupola, where the hard iron was made, I found it to be a round cupola 4 feet 6 inches in diameter, with a stack 5 feet or more in diameter. This cupola had five tuyeres; one was directly in front, and in line with the supply pipe; the others were scattered around at irregular distances apart. The tuyere in front of the supply pipe was admitting almost as much blast into the cupola as all the other four tuyeres put together, especially toward the last of the heat, when the tuyeres became clogged up. The iron was put into the cupola in charges of 4400 lbs., and the coal in charges of 350 lbs. The coal was put in in large lumps, and was not near enough to cover the iron, or separate the charges of iron properly. The stack of this cupola was too large to concentrate and equalize the heat, the tuyeres were not arranged so as to give an equal amount of blast to all parts of the stock, and the coal was not charged even enough to give an even heat, and the iron was not melted at an even temperature, which was the cause of the hard spots.

## HARD AND SOFT IRON.

When hard and soft iron are melted in the same cupola, as is often the case in jobbing and small foundries, the hard iron should be melted first one heat, and soft iron first the next heat, as part of the last iron will always stick in the lining; and if the hard iron is melted last, and the soft iron first, the next heat the first few ladles will be more or less hard, from the small particles of hard iron remaining in the cupola from the former heat.

Melting hard and soft iron in the same heat is a bad practice.

## SOFT IRON.

To melt iron soft and even, with an even shrinkage, it must be melted at an even temperature, and the nearer we can come to a natural draft the better for the iron. The tuyeres should be put in at equal distances apart, and so arranged as to admit an equal amount of blast at each tuyere. The tuyeres should be of a size to correspond with the blast pipe from the fan or blower, and the fan or blower should be run to suit the cupola. A too sharp and cutting blast is injurious to the iron, and slow melting is equally injurious, so that we must have a mild blast and volume enough of blast to do fast melting. The stack of the cupola should be small, and high enough to give the cupola a good, even draft; the bed should be evenly lit up, but not burnt too much before the iron is charged. Small coal or coke should be used all through the heat, and each bed of coal or coke should be properly leveled up before the iron is charged on it; so should each charge of iron be leveled up before the coal or coke is charged on it. The iron should be charged into the cupola from one to three hours before the blast is put on (according to the draft of the cupola), so as to have it heat up gradually and anneal. The iron should be put into the cupola in large charges, so as to give a good bed of coal or coke between the charges and separate them properly without using too much fuel. When different brands of iron are used the cupola should never be tapped close, but a few hundred of molten iron allowed to remain in the bottom of the cupola so as to give the iron a chance to mix.

## BURNED IRONS.

When in the malleable iron business, I often tried to melt the annealing boxes in a cupola, with coke, after they had been burnt out, but I never could produce more than 50 per cent. of iron, and the iron produced was so mixed with slag that it could not be used for castings without remelting. The iron produced was always white and hard. I made a test at the American Stove and Hollow-ware Company's foundry in Philadelphia, Pa., in July, 1874, in remelting annealing pots that had been used for annealing hollow-ware. These pots were about 2 inches thick; they were charged in the cupola in the ordinary way, Lehigh Valley coal being used as fuel. The result of this test was a product of about 70 per cent. of iron, which was so mixed with slag that it could not be run into castings; the iron was also white and hard. The larger percentage of iron produced when remelting the hollow-ware annealing pots than was produced when remelting the malleable iron annealing boxes, was caused by the hollow-ware pots being heavier and not so badly burnt, and not by the different fuels used in remelting. The best way that I have found for melting burnt iron in a cupola is to put it in the cupola with the regular charges of good iron, a little at a time; it will then act as a flux, and is better than limestone, especially if the iron is badly burnt; but care should be taken to not use too much of it at a time, as it will harden the good iron if used in too large quantities.

## SHOT IRON.

Every foundry has more or less shot iron, or fine scrap, from the rattle barrels and gangways. This class of iron, although made from the best of pig iron, will run hard when remelted, and in some cases will not mix with other iron (especially if the shot is rusted), but will cause hard specks in machinery or heavy castings, and will often sand-wich in stove-plate or light castings, forming a plate hard in the center and soft on each side. Foundrymen who run exclusively on first-class work have considerable trouble in getting rid of this class of iron, and it is often thrown out in the dump rather than remelt it. I made a test in remelting shot iron at the Baldwin Locomotive Works in Philadelphia, in June, 1874. In this test the shot iron was put up in wooden boxes, each box holding from 70 to 80 pounds; one ton

was then charged in a cupola, in the ordinary way, without any pig iron or other heavy iron; the result of this test was a white, hard iron when run into pigs, and a wastage of 25 per cent. I do not think anything was gained by putting the iron in the wooden boxes, for the boxes were all burnt up before the iron even became hot.

I also made some tests in melting shot iron at a stove works in Louisville, Ky., in May, 1875. In these tests the shot iron was charged on the first bed of coke, with a view of melting it first and using the iron for warming the ladles, and then pouring it into the pig bed or some heavy work. This way of melting the shot iron was a success so far as getting rid of the shot and using the iron was concerned; but it was found that the cinder and dirt, mixed with the shot iron, formed a coating of slag and dirt over the bed and prevented the cupola from melting; and a much larger percentage of fuel had to be used when the shot iron was charged on the bed. Tests were made at the foundry of Perry & Co., at Albany, N. Y., in melting a lot of shot iron that had got mixed with fine coal, and in order to separate the iron from the coal they thought they would burn the coal under their boiler and melt the shot iron, and have it run through the grate bars into the ash pit, and collect it in pigs. With this view a thin layer of fine coal and shot iron was spread over the fire, and the furnace closed up and the blast put on. Mica had been put into the furnace doors, so that the effect of the heat upon the iron could be seen. The result of this test was that when the iron came near the melting point the small shot threw off beautiful fiery stars of all colors and shapes, making a beautiful fire-works; and in these fiery stars all the iron was converted into the black oxide of iron, so that not a particle of iron could be found either on the grate bars or in the ash pit at the conclusion of the test. I have observed, in making tests to ascertain the percentage of iron lost in melting, that the percentage of loss was always greater when the shot iron was charged through the heat; and from different tests that I have made in melting shot iron I have concluded that it should not be charged on the bed or in the first of the heat, because more fuel will be required to make hot iron. It should not be charged in small quantities through the heat, for it is too much exposed to the gases of the cupola, and the oxygen of the blast converts it into the black oxide of iron, and it is lost. I find that the best results are produced when the shot iron is charged in a large body, as it was at the Baldwin Locomotive Works; it then lies compactly together and the heat melts it before the oxygen of the blast can convert it into an oxide. I think the best way for melting shot iron in a cupola is to charge it after all the other iron has been charged into the cupola; it then forms a cover over the iron and prevents the escape of the heat, and the loss by the wastage of iron may be made up by the saving of fuel. It also improves the quality of the shot iron to melt it at the last of the heat, when the cupola is hot. Shot iron, if melted and run into pigs, will mix with other iron when remelted.

Shot iron has been melted in iron boxes or pots with about the same results as in the wooden boxes.

## SHRINKAGE OF IRON.

Irons will vary in shrinkage. Some irons will not shrink any, and others will shrink as high as a quarter of an inch to the foot. The average shrinkage, and the shrinkage always counted on in making patterns, is one-eighth of an inch to the foot.

**Underground Telegraphy.**—The Philadelphia *Ledger* says: "Underground telegraphy was the subject of much discussion and some disputes a few months ago, when a change in the office of the Western Union Telegraph Company in this city seemed to offer a favorable opportunity to lay underground wires. For some reason the plan does not advance rapidly in this country, although there are lines laid underground in many of the larger cities of Europe, and the underground system has been adopted for some long lines through the interior, where expensive arrangements for the repair of broken or disarranged wires cannot be made. A line was laid underground between Berlin and Cologne as early as 1845, but proved a complete failure, owing to the presence of sulphur in the gutta-percha with which the wires were covered, and which destroyed the gutta-percha. That failure brought subterranean telegraphy into disrepute, and for 25 years few attempts were made to lay underground cables on a large scale. At present, however, Germany has seven underground lines between its capital and its western frontier. A line between Berlin and Mayence, passing through Halle, Leipzig and Frankfurt, has been recently completed. The wires are twisted together and covered with hemp and iron, and the cost is about six times as great as that of the same number of overground wires would be. This line is 600 kilometers, or about 372 miles in length, and no doubt is entertained that it will work well. A short underground line is being laid, we understand, in West Philadelphia, with the aid of all the protective devices developed by experience." The *Ledger* does not seem to understand that telegraph wires laid underground are very like ordinary submarine cables, and very serious retardation takes place in them. The open-air lines are the best, and the higher they are from the ground the more satisfactory their working. It will by no means be a blessing to the public to have the wires buried, as in the end it may materially increase the cost of telegraphing. The true remedy is probably in the direction of larger poles, stronger wires, with better conducting power, and finally, placing the poles further apart.

**Pulverizing Minerals.**—A simple apparatus, intended principally for disintegrating superphosphates, clay, earth, coal, or other minerals, has been invented by H. and E. Albert, of Biebrich-am-Rhein, and consists chiefly of a peculiarly constructed open drum and wheel. Upon an axle mounted on suitable bearings is keyed a boss having a disk at one end. To this disk are bolted, say, four arms, near the extremities of which is fixed a concentric ring; parallel to this

ring are two other rings of similar diameter, and these rings are connected to the former by a series of cross stays or rods, both at their points of junction with the arms and also at intermediate points. Thus it will be seen that an open drum or wheel will be formed, having arms at one side only, and mounted upon an axle to which a rapid revolving motion (say, from 300 to 500 revolutions per minute) is imparted by means of a strap or belt passing round a pulley keyed on one end of the axle. The superphosphate or other material to be pulverized is delivered by means of a hopper into the interior of this drum or wheel, and in falling it meets with the cross-stays or rods in their rapid revolution in the reverse direction, and becomes thereby thoroughly pulverized or disintegrated. A movable hood is placed over the upper half of the drum or wheel. In a modification of this invention the hopper is placed so as to deliver the superphosphate or other material on to the outside of the wheel instead of the inside, in which case the drum or wheel may have arms on both sides of the boss.

## The Use of Salt in Working the Comstock Lode Ores.

The Virginia *Enterprise* gives the following account of the Eagle Salt Works, which furnish the supply of salt for the mills: The amount of common salt used in the mills working ore from the Comstock range is from 300 to 400 tons per month, there being less used in winter than during the summer, as the tailing mills (which use a great deal of salt) are then running much longer, owing to the difficulty experienced in drying slimes.

The salt used in our mills all comes from the Eagle Salt Works, situated on the line of the Central Pacific Railroad, 16 miles east of Wardsworth. It is a very pure article. It is said that it is absolutely nothing but salt, there being no foreign substance or mineral in it. Much of the salt shipped from the works is taken off the cars at mills along the Carson River, at Silver City and at Gold Hill. It is put up in strong sacks, of a size convenient for handling, and arrives here in excellent condition. The salt sells at a cent and a half per pound, or \$30 per ton by the carload. A car holds about 10 tons.

Contrary to the generally received opinion, the salt is not procured in a marsh. At the place where the salt is found there is nothing resembling a marsh. Instead there is seen a large basin or sink, the surface of which is covered with sand. This basin has no present outlet, and presents the general features of an extinct lake—a lake from which all the water has evaporated.

The source of the salt found in the basin has been traced to a ravine, in the head of which a well has been sunk to the depth of twelve feet. Shallow as the well is it affords as much water as can be raised with a six-inch pump. Should an artesian well be sunk at this point the water would no doubt rise to the surface and flow from the well.

The taste of the well has but a slightly brackish taint and is as colorless as though it had been distilled. Specimens of the water in bottles are to be seen at the store of J. C. Hampton & Co., in this city, Mr. Hampton being the agent for the sale of the salt on the Comstock. He has specimens of the water in all stages of strength or concentration, starting with that just taken from the well and ending with that which has been in the vats 30 days, and which is just on the point of becoming solid crystals of salt; indeed a specimen but one week in the vats showed at the bottom some crystals of salt.

From the well the water is pumped into large reservoirs, where it is allowed to stand for some time, when it is conducted to the evaporating vats. The ground on which the reservoirs and vats are situated is gently descending. Neither reservoirs nor vats are made of lumber, but are built in the earth, and of the earth and sand found on the spot.

The surface of the basin is, as above stated, covered with sand. This sand averages about two feet in depth, and under it lies a stratum of tough clay. The vats are made by scraping away the sand down to the clay, and are 60 feet in width by from 200 to 300 feet in length. There being a slight inclination in the ground the water is gradually passed forward from one vat to another, growing stronger and stronger, until in the last it becomes pure salt crystals. There are ten rows or tiers of these vats, and in all they cover an area of about eight acres.

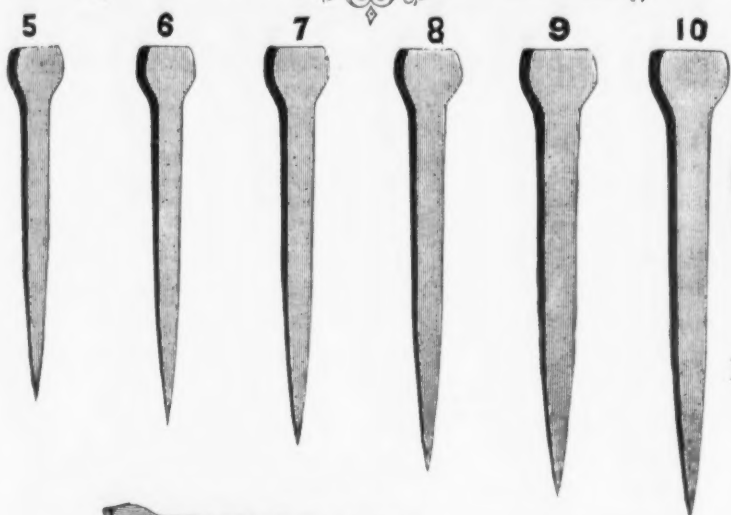
By sinking a few feet in the stratum of clay underlying the surface sand (which seems to have blown in off the surrounding deserts) saline water similar to that obtained from the well is found. This water appears to be drawn up by the sand, when it speedily evaporates, leaving the surface coated to a considerable depth with pure white salt.

Surrounding the vats are reservoirs into which water from the well is conducted. These reservoirs are so loosely constructed that the water oozes out through their banks or walls, and, percolating the intervening sand, finally finds its way into the vats. In passing from the reservoirs to the vats the water leaches out and takes up all the salt formed in the sand and thus gains much in strength. This leaching part of the process is of great advantage in summer, when the evaporation is rapid and salt is quickly formed on the surface of the sand. The time will doubtless come when the surface sand will be shoveled into wooden vats and leached out as ashes are leached at potash works. Even in the clay, masses or pockets of crystals of pure salt are found.

The company owning the works have store-houses on the railroad. They also grind and put up an excellent article of salt for table and dairy use. Owing to the dryness of the atmosphere the salt put up at the Eagle Works is almost entirely free from moisture; whereas that brought from San Francisco is quite damp. Parties have several times undertaken to compete with the Nevada Works by bringing salt from California, but on account of the great amount of moisture the article imported contains they have failed to make it a paying business. Doubtless, should the Nevada salt be taken to San Francisco and there stored for a time in the moist atmosphere, it would become, by absorption, quite as damp as that imported from the East.

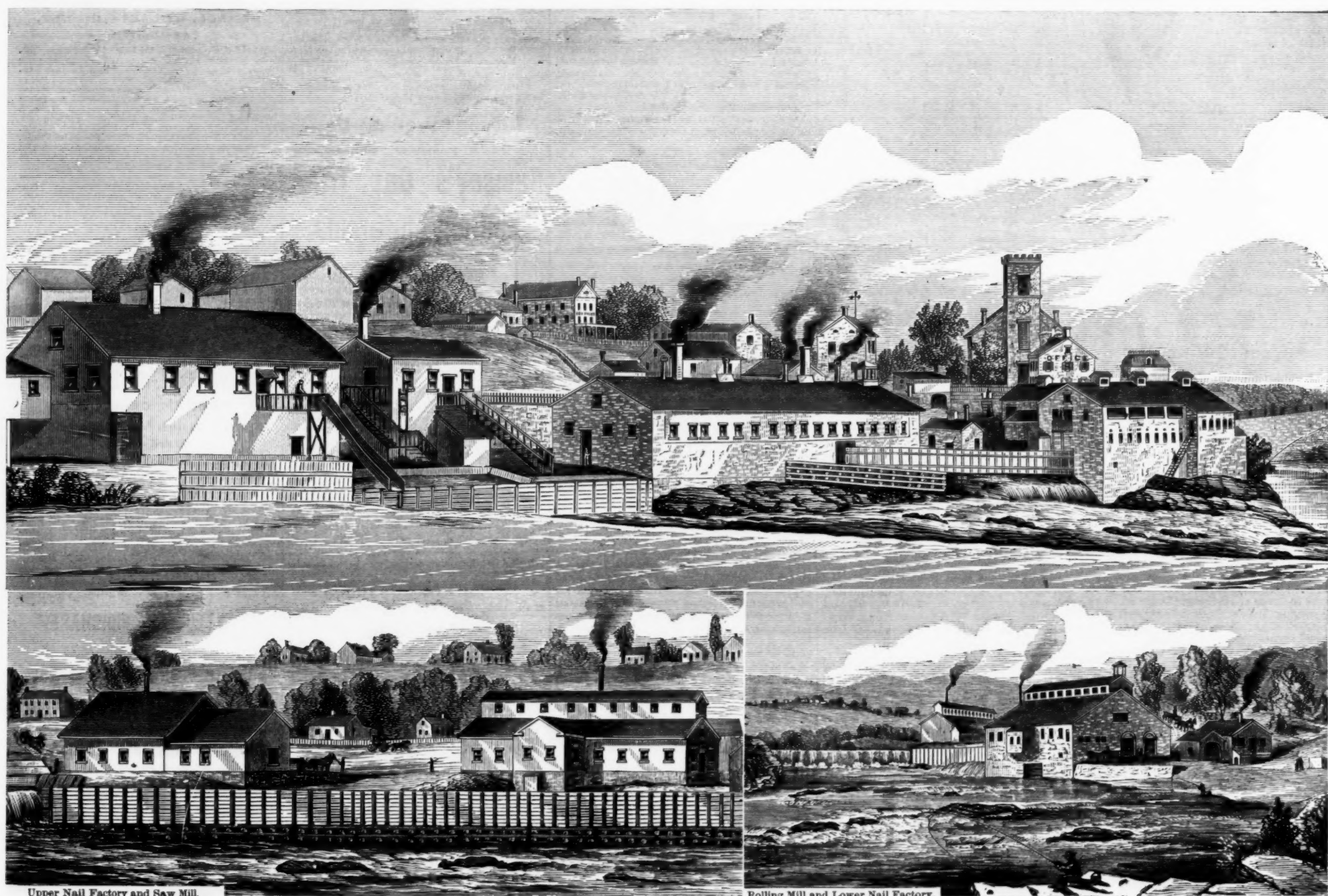
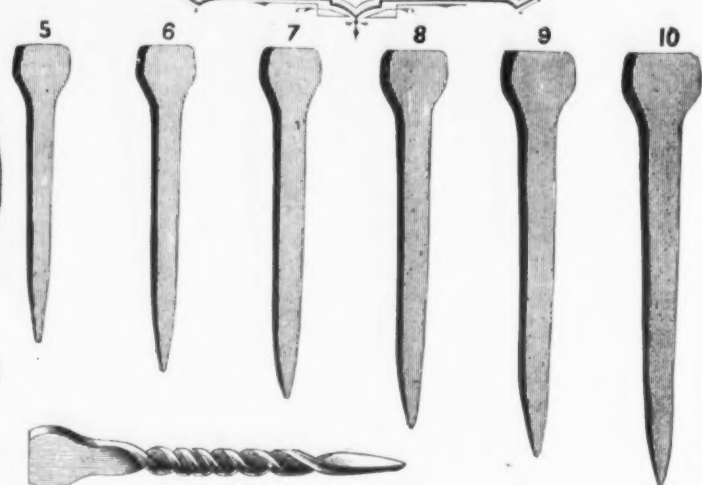


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## Crown Can Opener.

The American Machine Co., No. 430 Walnut street, Philadelphia, have recently added to their specialties the Crown Can Opener, which we illustrate herewith. It is a simple and very practical tool, and will open any kind of can neatly and quickly. As is shown in the cut, it has a handle with two pointed blades, each blade having one cutting edge. It is operated by piercing the lid of the can near the side, so that one blade passes down on the inside (to cut the lid), the other on the outside (acting as a guide) depressing the handle causes the edge to cut through the lid, and by raising the handle, pushing the tool forward and again depressing it the cutting is continued. The operation is very simple, and a single trial is sufficient to teach a person to handle it to good advantage. The handle at the upper end is looped for the convenience of hanging it up when not in use; the whole tool is tinned. It is placed on the market at a very low price, as will be seen by reference to our trade report under the head of General Hardware.



## Lever and Cam Valve.

Steam fitters and others who have to use stop valves of any size from one inch up, will be interested in the lever and cam valve which we illustrate, the invention of Messrs. Henry S. Landell and John S. Leng. This valve, which takes up very little room, has a straight open passage the full size of the pipe. The pressure bears against the back of the gate, tending to keep the valve tight. A quarter turn of the wheel is sufficient to



open or close the valve. The guides of the gate itself are so arranged that in opening the valve, as soon as the joint is broken and the gate leaves its seat, it is entirely free, and there is no friction between gate and seat. An indicator wheel shows the position of the gate at all times. There are very few moving parts. Messrs. Lenig & Ogden, 212 Pearl street, New York city, are the general agents.

## American Piano Castings.

In a special report on American metals and metallurgical operations as shown in the Centennial exhibits, Herr Franz Kupelweiser, of Vienna, Professor of Metallurgy and Director of the Imperial Austrian Mining Academy, says of some American piano castings examined by him:

The iron used in the castings of Steinway's pianos shows the following composition on analysis by Professor Otto, of Brunswick, and by myself:

Iron.....	94.71
Carbon (graphitic).....	3.34
Carbon (combined).....	0.15
Silicon.....	1.20
Manganese.....	0.50
Sulphur.....	0.08

Total..... 99.98  
Specific weight, 7.28.  
Tensile strength, 2270 k. per sq. cent.

No trace of phosphorus was discovered, nor is there any appreciable quantity of arsenic. It appears from this that Steinway's castings contain very little carbon—scarcely more than some steels. The cast parts not accounted for in the analysis consisted of something which the determination did not establish, and the Steinways did not say what it was. This is understood to be a secret known only to the manager of their foundry at Astoria, L. I.

**A New Merchant Mill.**—Brown, Bonnell & Co., of Youngstown, Ohio, are getting the material on the ground for another rolling mill. It is to be a merchant mill for the manufacture of hoop and band iron and, possibly, cotton ties. The mill is to be put up just to the south and east of the merchant department of the new mill, on the site of the old forge. Its dimensions are 180 feet long by 60 feet in width, and it will cover two trains of eight-inch rolls, with room for three high sheet rolls that will be built hereafter. Brown, Bonnell & Co. have never engaged in the manufacture of hoop iron or cotton ties, but the firm is becoming so well and favorably known throughout the country that they are being pressed for this kind of iron and are building the new mill to accommodate their customers. The new mill will give employment to from fifty to seventy-five additional men and boys. Their own carpenters are busy at work on the frame.

We are not informed whether the foundation is to be of brick or stone. In addition to this mill that will be built, Messrs. John Ellis and O. D. Jones, the contractors, are building for Brown, Bonnell & Co. a stock room on the northeast side of the Phoenix Furnace, and another on the south side. The one on the northeast side is to be 100 feet in length by 66 feet in width, to be used as a stock room for ore and limestone. The other will be 178 feet long and 66 feet wide, to be used as a stock room for coke.

## Charcoal Iron Making in Kentucky.

The following proportions of the eleven charcoal furnaces of the Kentucky portion of the Hanging Rock iron region are taken from Shaler's Geological Survey:

	Bellefonte.	Boone.	Burns Vista.	Buffalo.	Hunnewell.	Iron Hills.	Kenton.	Laurel.	Mt. Savage.	Pennsylvania.	Raccoon.
Height.....	34 ft.	44 ft.	7 in.	40 ft.	36 ft.	6 in.	40 ft.	37 ft.	39 ft.	35 ft.	35 ft.
Diameter of hearth.....	10 ft.	10 ft.	10 ft.	10 ft.	10 ft.	10 ft.	10 ft.	10 ft.	10 ft.	10 ft.	10 ft.
Butter of.....	53 deg.	53 deg.	53 deg.	53 deg.	53 deg.	53 deg.	53 deg.	53 deg.	53 deg.	53 deg.	53 deg.
Diameter of throat.....	3 ft.	3 ft.	3 ft.	3 ft.	3 ft.	3 ft.	3 ft.	3 ft.	3 ft.	3 ft.	3 ft.
Number of tuyeres.....	1	1	1	1	1	1	1	1	1	1	1
Number of bolters.....	4 in.	4 in.	4 in.	4 in.	4 in.	4 in.	4 in.	4 in.	4 in.	4 in.	4 in.
Diameter of.....	2 ft.	2 ft.	2 ft.	2 ft.	2 ft.	2 ft.	2 ft.	2 ft.	2 ft.	2 ft.	2 ft.
Length of.....	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.
Number of blast cylinders.....	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.
Diameter of.....	3 ft.	3 ft.	3 ft.	3 ft.	3 ft.	3 ft.	3 ft.	3 ft.	3 ft.	3 ft.	3 ft.
Diameter of steam cylinder.....	1 ft.	1 ft.	1 ft.	1 ft.	1 ft.	1 ft.	1 ft.	1 ft.	1 ft.	1 ft.	1 ft.
Stroke of.....	5 ft.	5 ft.	5 ft.	5 ft.	5 ft.	5 ft.	5 ft.	5 ft.	5 ft.	5 ft.	5 ft.
Kind of hot blast.....	Direct.	Direct.	Direct.	Direct.	Direct.	Direct.	Direct.	Direct.	Direct.	Direct.	Direct.
Hoops.....	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.
Davies.....	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.	4 ft.

As will be seen from the above table the general details of construction are similar, excepting in the cases of Hunnewell and Iron Hills—Hunnewell being built on a model similar to the one generally adopted, but Iron Hills being constructed on a totally different plan. The lamentable failure of the latter (worked with a bell and hopper, which forced the gas down through a main to underneath the boilers) will at once explain itself to the eye of the experienced ironmaster, which was additionally evidenced by the fact that after the change of that furnace to proportions similar to those generally used in this region, she is now doing very well, running under the name of Charlotte.

Buena Vista has been dismantled altogether, and has been replaced at a location 1½ mile east of the old site by the new Princess, stonecoal furnace, of which we will speak more fully in our next paper.

In connection with these statements it will be of interest to compare the following table showing the average consumption of bushels of charcoal to each ton of pig iron made in the respective years, and the quantity of iron made, ending with 1874:

	Years.	Charcoal.	Years.	Iron Made.
Bellefonte.....	5	185	5	15,761
Burns Vista.....	5	141	5	17,761
Boone.....	3	220	5	7,755
Hunnewell.....	3	161	5	17,829
Kenton.....	4	197	5	11,274
Laurel.....	4	175	5	7,553
Mt. Savage.....	3	164	4	10,017
Pennsylvania.....	5	164	5	9,513
Raccoon.....	1	163	5	5,666
Iron Hills.....	1	276	1	953
Boone.....	1	276	1	2,600

Total tons..... 106,680

\*Working cold blast part of the time.

Bellefonte (Ky.) Furnace, under the efficient management of Charles Mead, Esq., continues in successful operation, making an average of from 12 to 13 tons of No. 1 foundry iron, which, considering her size (she is only 34 feet high, less a 6-foot thimble), is a very fair result. It is thought that her stock of charcoal, coming in and on hand, will be sufficient to run her till the middle of February. Ore is arriving at the rate of 40 tons per day, which is paid for at from \$2.25 to \$2.75 per ton. Her charcoal, which is hauled by eight large furnace teams, costs about \$9 delivered on the bank. The reality of the firm owning this furnace, Means, Russell & Means, embraces the old Amanda, Clinton, Bellefonte and other tracts, amounting to 26,000 acres of wood, iron ore, coal and farming lands. This furnace has now on hand for sale not less than 3500 tons No. 1 pig metal.—Greenup Independent.

## Special Notices.

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## PROSPECTUS.

It is evident to all who are well informed as to the state of the metallurgical industries of the world, that we have fairly entered upon an era of exceptionally rapid scientific progress, in which many of the old methods of treatment will be superseded by new and more economical processes. The "New Metallurgy" demands a current literature of its own. Newspapers cannot give space to the calm discussion of matters of purely scientific interest; books can, at most, follow progress at a distance. The *Metallurgical Review* is intended to be a record of current progress, which shall combine the enterprise of a newspaper with the convenience and permanent value of a book. Its interest is both scientific and practical, and its contributors will spare no pains to secure valuable original contributions from writers of known ability and recognized scientific standing, American and foreign.

The field of *The Metallurgical Review* includes whatever is new and important, or which possesses historical or practical interest relating to the metallurgy of the useful metals, from the mining of the ores to the final processes which make the metals available as materials in the arts. Matters of scientific interest indirectly connected with these subjects will also be considered, when of importance to the student or the original investigator.

The indexing of the volumes will be very complete. Each will have a general index of titles and a full topical index to aid the student in searching for facts and references. It is intended that a set of volumes shall be a valuable library of metallurgical literature, and nothing will be omitted which can in any way contribute to the convenience of the reader.

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One Brainerd Index Milling Machine.  
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One No. 4, Geared Stiles Press.  
Two Engine Lathes, 15 in. swing, 6 ft. bed.  
Two Engine Lathes, 22 in. swing, 8 ft. bed.  
One Engine Lathe, 76 in. swing, 36 ft. bed.  
One Planer, planes 70 in. wide, 52 in. high, 27 ft. long.  
One Engine Lathe, 15 in. swing, 6 ft. bed; one Engine Lathe, 15 in. swing, 8 ft. bed; one Engine Lathe, 22 in. swing, 16 ft. bed; one 22 in. swing Upright Drill; three 4-spindle Drills; four common Milling Machines; one Brown & Sharpe Universal Milling Machine; one 36x60 ft. Planer; one 5 in. Shaper; one Gear Cutter; one 2-spindle Profiling Machine; one No. 1 Bliss & Williams Press; one "Bement" No. 2 Cutter and Key Seat Drill; one new "Hardaway" Bolt Heading Machine, to head up to ¾ in. bolts; one new Hardaway Bolt Heading Machine to head up to 1½ inch bolts; one "Merriman" Bolt Cutter, to cut up to 1½ in. bolts; one "Davy Bros." 1200 lb. Steam Hammer; one "Ferris & Miles" 2000 lb. Steam Hammer.

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## New and Second-Hand Boilers Engines, &c.

## New Engines and Boilers.

15 horse Horizontal Engine, 8x12 cylinder, double crank, \$330. 15 horse Horizontal Engine, 8x12 cylinder, single crank, \$330. 20 horse Horizontal Engine, 9x12 cylinder, single crank, \$375. 10 horse Vertical Engine, 6x12 cylinder, \$350. 4 horse Vertical Engine, 4x12 cylinder, \$110. 4 horse Engine and Boiler, complete, ready to run, \$240; boiler vertical tubular, tested to 150 lbs. 5 horse Engine and Boiler, complete, ready to run, \$385; boiler, vertical tubular, tested to 150 lbs. 3 horse Vertical Engine and Boiler, complete, ready to run, \$175. 8 horse Bacon Holding Engine and Boiler, complete, ready to run, \$575. 4 horse Vertical Tubular Boiler, \$125. 6 horse Vertical Tubular Boiler, \$145. 8 horse Vertical Tubular Boiler, \$160. 11 horse Vertical Tubular Boiler, \$200. 16 horse Vertical Tubular Boiler, \$250. 40 horse Horizontal Tubular Boiler, \$580. One Upright Drill, swing 24 in., \$125.

## Second-Hand Engines, Boilers, &amp;c.

60 horse Horizontal Engine, 16x20 cylinder, \$800, good order. 60 horse Locomotive Style Boiler, \$200, good order. 6 horse Locomotive Style Boiler, \$125, good order. 4 horse Vertical Tubular Boiler, good as new, \$100. 12 horse Horizontal Engine, 7x12 cylinder, pump, heater and governor, \$225, good as new. 11 horse Vertical Engine, 7x10 cylinder, \$200. 8 horse Horizontal Engine, 6x12 cylinder, \$125, good order.

We also have two new power or hand Pipe Cutting and Threading Machines, cut from ½ to 2 in. pipe, with full sets of dies, ½ to 2 nipple sockets, price \$60 each; several bench and foot lathes from \$30 to \$50.

Also Steam Pumps, Pipe, Belting, Valves, Fittings, &c., &c., &c.

Write us, stating what you want, new or second-hand, and we will answer cheerfully.

## Lovegrove &amp; Co.,

125 N. Fourth St., Philadelphia.

## Ramsey's Car Truck Shifting Apparatus.

## A Practical Testimonial.

PENNSYLVANIA & NEW YORK CANAL & R. R. CO.,  
Office of General Superintendent,  
SAVRE, PA., August 17th, 1877.  
To whom it may concern: This company has just constructed, at Erie Railway Junction, near Waverly, N. Y., a RAMSEY CAR TRUCK SHIFTING APPARATUS. The undersigned, who have examined the construction and operation of this apparatus, have no hesitation in recommending its adoption for changing car trucks, or transferring through cars between roads of different gauges, and believe it to be the cheapest, simplest, most reliable and rapid device for that purpose now in use. At the trial to-day, with some parts of the machinery unfinished, a box-car was run over the pit, a distance of 200 feet, changing the trucks in 2 minutes and 15 seconds for the whole operation. It is believed that, with a longer pit and an increased number of side trucks, the time can be reduced to one minute per car, with no other motive power than gravity, and without the use of skilled labor.

R. A. PACKER, Gen'l Supt.,  
Penna. and New York Canal and R. R. Co.  
R. F. GOODMAN, Asst. Supt.,  
Penna. and New York Canal and R. R. Co.  
J. N. WATSON, Acting Master Mechanic,  
Penna. and New York Canal and R. R. Co.  
JOHN TAYLOR, Gen'l Freight Agent,  
Lehigh Valley R. R. Co.  
W. STEVENSON, Gen'l Supt.,  
Geneva, Ithaca and Sayre R. R. Co.

Any information desired can be obtained by addressing

RAMSEY & SCARLETT,  
Box 162, Cobourg, Ontario, Canada.

## For Sale.

The business of the late L. B. Flanders, together with Stock, Tools, Fixtures, &c. The business is well established and the specialties are all protected by patents. There is also a good general machine business established, making it a very desirable investment for a live business man. For further particulars, address

L. B. Flanders' Estate,  
1025 Hamilton St., Philadelphia.

A GENTLEMAN HAVING A FOUR YEARS' experience in the agricultural implement trade on the continent, desires to make an engagement in a similar line, or in machinery or manufactures.

Has a first-class acquaintance in Germany, Austria, Belgium, Holland, Sweden, France and Russia. Best of references given. Address

P. O. Box 972, Auburn, N. Y.

## SPECIAL NOTICE.

The undersigned offer their services as agents to American Producers of Metals. They represent foreign brands of Zinc, Russia Iron, Hoop Iron, Window Glass, Cutlery and Guns.

LOUIS WINDMULLER & ROELKER,  
20 Reade Street, N. Y.

## Notice

is hereby given that the partnership lately subsisting between the undersigned under the firm name of W. M. B. HAMMOND & Co. was this day dissolved by mutual consent. Either member will sign in liquidation. WINTHROP M. B. HAMMOND.  
Sept. 18th, 1877. WILLIAM S. MIDDLETON.

Notice is hereby given that a copartnership was this day formed by the undersigned under the firm name of W. M. B. HAMMOND & Co. Business will be carried on at 34 Warren Street in the city of New York.

JOHN P. LYNCH.  
WINTHROP M. B. HAMMOND.  
Sept. 18th, 1877. WILLIAM S. MIDDLETON.

## Wanted—A Partner,

In a foundry and machine business, already well established. Locality splendid and healthy.

A practical man with means is wanted to join a practical man who is already well established.

Address CAR WHEEL FOUNDRY,  
P. O. Box 134, Selma, Alabama.

## Wanted,

A General Agent in every State in the Union, for the sale of Wrought Iron Highway Bridges, new in design, combining maximum in strength and minimum in cost. For particulars address

WM. O. DOUGLAS,  
Binghamton, N. Y.

## Special Notices.

## CHARLES OTTO,

P. O. Box 1199.

(Established 1854.)

Importer & Dealer in HARDWARE, Manufacturers' Agent, etc.

12 & 14 Front and 250 & 252 Market St., San Francisco.

I am prepared to make arrangements with Eastern manufacturers to act as their agent for the sale of Hardware, etc., on the Pacific Coast.

## REFERENCES:

Sargent & Co., 37 Chambers Street, New York.  
Van Wagoner & Williams, 82 Beekman St., N. Y.  
T. Hessebruch & Co., 10 N. 5th St., Philadelphia.  
The Pennsylvania Tack Works, Norristown, Pa.  
The Pacific Bank, San Francisco.

## Export to Germany

And Surrounding Countries.

## Agency for Soliciting Patents

In the German Empire.

See the new Patent Law published in *The Iron Age* of June 21, 1877.

## Hammacher &amp; Delius,

HAMBURG, GERMANY.

Dealers in exclusively American Hardware, Agricultural Implements, House-Furnishing Goods, &c.

HOUSE IN NEW YORK.

A. HAMMACHER & CO.

## Auction Notice.

BISSELL, WELLES & MILLET, Auctioneers,

will hold their next Special Sale of Hardware, Cutlery, French Tinned Ware and House-keeping Goods, Guns, &c., on Thursday and Friday, September 27th and 28th, at their salesroom, No. 15 Murray Street. This sale will comprise large lines of Hardware in great variety, full and complete lines of French Tinned and Enameled Ware, a large and desirable line of Table and Pocket Cutlery, Carvers, Shears, S. P. Forks and Knives. This sale will be worthy the attention of the Trade. Consignments solicited from manufacturers and importers. These sales afford those having surplus stock to realize the cash quickly.

WANTED.—A first-class business man familiar with machinery and manufacturing, capable of handling large bodies of men, desires a responsible position. Reference satisfactory. Address,

IRON AND STEEL,  
Care of P. O. Box 813, Bridgeport, Conn.

## DROP FORGINGS.

The TRENTON VISE & TOOL WORKS, Trenton, N. J., having increased their facilities, are now able to do all kinds of

Iron and Steel Drop Forgings in quantities to order at reasonable rates.

HERMANN BOKER & CO., Proprietors,  
101 & 103 Duane St., N. Y.

## SCHMIDT &amp; ELBERS,

BREMEN, GERMANY.

Dealers Exclusively in American Hardware.

Manufacturers who wish to have their goods introduced in Germany, please correspond.

## Wanted,

A party to buy part or all of a Patent right (here and in Canada) of a most valuable invention, connected with all classes of Steam Engines—principally Locomotives—or would arrange with a party to manufacture on royalty. Address, for one month, A. ALEXANDRE,  
Office of *The Iron Age*, 220 S. 4th St., Phila., Pa.

## WANTED TO PURCHASE,

Immediately, a

## Hardware Business in the West.

Address, at once, WILLIAM SHORROCK,

37 Main Street, Paterson, N. J.

## Hardware Business For Sale.

The old Stand, Stock and Good Will of the late E. H. Fogg. This store commands the largest wholesale and retail trade east of Portland. The best of help, and doing a prosperous business. Address H. H. FOGG,  
Bangor, Me.

## TO LET,







Metals. Manila Rope is in good request and firm at quoted rates.

The purchasing prices offered by dealers for Old Metals are as follows:

	Per Ton	Per Cwt.
Copper	10.00	66.66
Yellow Metal	10.00	66.66
Brass, heavy	10.00	66.66
Brass, light	10.00	66.66
Composition, heavy	10.00	66.66
Lead, solid	10.00	66.66
Tea Lead	10.00	66.66
Zinc	10.00	66.66
Pewter, No. 1	10.00	66.66
Pewter, No. 2	10.00	66.66
Spelter	10.00	66.66
Wrought Iron	10.00	66.66
Light do.	10.00	66.66
Stove Plate	10.00	66.66
Machinery do.	10.00	66.66
Burned Iron	10.00	66.66

The prices current for Rags, &c., are as follows:

	Per Ton	Per Cwt.
Canvas, Linen	10.00	66.66
Cotton, No. 1	10.00	66.66
" No. 2	10.00	66.66
White No. 1	10.00	66.66
Colored do.	10.00	66.66
Mixed, Woolen	10.00	66.66
Soft, do.	10.00	66.66
Gunny Bagging	10.00	66.66
Butte	10.00	66.66
Kentucky Bagging	10.00	66.66
Book Stock	10.00	66.66
Newspaper Stock	10.00	66.66
Waste Paper and Scraps	10.00	66.66
Kentucky Bale Rope	10.00	66.66
Cakum Junk, No. 1	10.00	66.66
" No. 2	10.00	66.66
Tarred Shaking	10.00	66.66
Grass Rope	10.00	66.66

## IMPORTS

Of Hardware, Iron, Machinery, Metals, &c., from the Port of New York, for the Week ending Sept. 11, 1877:

Hamburg.	Quant.	Value.	British Honduras.	Quant.	Value.
Brit. ware, cs.	5,148	\$1,185	Hdw., pkgs.	16	232
Sew. mach., cs.	49	840	Nails, kegs.	34	80
Belt, cs.	1,812	1,812	Mach'y, pkgs.	8	163
Hdw., pkgs.	14	1,112			
Mr. iron, pkgs.	20	275			
Spelt, plates	1,367	4,600			
Mach'y, cs.	4	1,738			
Bullets, cs.	3	290			
Ag. imp., cs.	3	290			
Put ware, cs.	7	1,748			
Ag. imp., pkgs.	12	990			
Hdw., cs.	45	1,350			
Lamps, cs.	5	250			
Mr. iron, pkgs.	17	240			
Pumps, pkgs.	1	120			
Dutch West Indies.					
Metal, cs.	2	100			
Hdw., pkgs.	51	924			
Barrows, cs.	60	75			
Mach'y, pkgs.	3	148			
Liverpool.					
Hdw., pkgs.	54	4,056			
Tel. ins., cs.	4	974			
Mach'y, cs.	4	800			
Pumps, cs.	2	250			
Clocks, pkgs.	52	4,400			
Sew. mach., cs.	16	3,475			
Brakes, cs.	5	120			
Lp. d's, pkgs.	25	1,075			
Ag. imp., pkgs.	6	250			
London.					
Hdw., pkgs.	146	2,954			
Clocks, cs.	688	12,524			
Ag. imp., pkgs.	3	175			
Belt, cs.	3	175			
Grindstones, cs.	151	180			
Wringers, cs.	4	258			
Mach'y, cs.	17	1,435			
Lamps, pkgs.	13	325			
Carmls., cs.	13	325			
Sew. mach., cs.	90	6,706			
Glasgow.					
Belt, cs.	4	560			
Hdw., cs.	7	339			
Clocks, cs.	37	497			
Wheels, cs.	3	493			
British North American Colonies.					
Nails, kegs.	100	350			
Hdw., pkgs.	12	135			
Mr. iron, pkgs.	61	600			
Iron safes, cs.	2	700			
Axles, cs.	25	100			
British West Indies.					
Lamps, pkgs.	13	93			
Hdw., pkgs.	127	1,890			
Mr. iron, pkgs.	28	315			
Clocks, pkgs.	6	110			
Cr. ge. mll., pkgs.	6	407			
Nails, kegs.	235	780			
Ag. imp., pkgs.	12	182			

## IMPORTS

Of Hardware, Iron, Steel and Metals into the Port of New York, for the Week ending Sept. 11, 1877:

Hardware.	Whitney A. R. & Bros.
Althof, Bergman & Co.	Without Bill of Lading.
Berkebeck J. & Co.	Bars, 2163
Cases, 2	Bundles, 61
Baker Hermann & Co.	
Razors, cs. 1	Brown William,
Knives, cs. 6	Bundles, 62
Scissors, cs. 1	Cases, 7
Hdw., pkgs. 8	Frith Edward
Guns, cs. 3	Miles, pkgs. 15
Drexel, Morgan & Co.	Mitander Nils
Cutlery, cs. 1	Bessmer blooms,
Ely & Wray	pcas, 410
Cases, 1	Prosser Thos. & Sons,
Folsom H. & D.	Packages, 24
Mdse., pkgs. 8	Sulzbacher, Hyman &
Fisher J. L.	Wolfe,
Saws & tools, cs. 1	Bars, 147
Harner William & Co.	Packages, 24
Mdse., pkgs. 3	Order.
Hecker P. J.	Bundles, 261
Case, 1	Cases, 13
Langland & Co.	Cashy Morris,
Mdse., bbls. 120	Zinc, cs. 20
Mdse., rolls, 16	Aikman James & Co.
Mdse., cs. 5	Tin plates, bxs., 127
Lamarche H.	Brace, cs. 2
Arms, cs. 13	Term plates, bxs., 21
Merchants' Dispatch Co.	Tin plates, bxs., 30
Arms, cs. 1	Cort N. L. & Co.
Morse J. P. Sons,	Tin plates, bxs., 1315
Arms, cs. 1	Dickerson, Van Dusen &
McCoy & Co.	Co.
Mdse., pkgs. 12	Tin plates, bxs., 1203
Owen A.	Franklyn C. G.
Arms, cs. 60	Tin plates, bxs., 330
Schroverling & Daly	Hogan & Billing
Mdse., pkgs. 2	Lead, bars, 2350
Wiebusch & Hilger Hdw.	Lamarche H.
Co.	Zinc, cs. 25
Cutlery and Hdw.,	Merchants' Dispatch Co.
pkgs. 33	Antimony, cs. 2
Anvils, 100	Naylor & Co.
Wolfe N. S. & Co.	Tin plates, bxs., 1977
Ironware, cs. 10	Phelps Dodge & Co.
Ward Ashtine,	Tin pl'ts, bxs., 11,528
Mdse., pkgs. 4	Schneider Jns. & Co.
Order.	Tin plates, bxs., 1267
Per. caps, cs. 4	Schmidt O. E. & Co.
Cases, 1	Lead, pkgs. 2300
Casks, 1	Order.
Files, cs. 1	Lead, pkgs. 6574
Wire netting, rolls, 60	Tin plates, bxs., 1661
	Term pl'ts, bxs., 1661
	Tin and term plates,
	bxs., 433
	Tin, bxs., 130
	Antimony, cs. 50
	Kidder, Peabody & Co.
	Bars, 2188
	Marcel W. D.
	One ton, 600
	Mitander Nils
	Swedish bar ends,
	Boxes, 351
	Tin ore, kegs., 2
	Samson Geo. G.
	Pig tons, 150

## COAL.

The condition of the trade during the past week has altered very little from that of the week previous. There is a brisk demand for Coal, and those who have it for sale are pretty well filled with orders. The manufacturing sizes are reported scarce by some dealers. At the present time there is comparatively little Coal in the market, although the tonnage from those regions still at work has increased enormously. For example, the Philadelphia and Reading during the week ending September 1 carried 178,000 tons, against 64,000 tons for the same week in 1876. For the four weeks ending September 1, 1877, this road carried some 630,000 tons of Coal, while in the previous year, during the same time, the amount was 30,000 tons. Mr. Seward's tonnage figures brought down to date show that from the Wyoming region, now idle, nearly 600,000 tons more Coal were produced this year than last. The Lehigh Coals also show about the same increase in production for the year, while for the Philadelphia and Reading road the tonnage is nearly 1,600,000 tons ahead of last year, and is rapidly increasing.

Reports from the regions show that there are signs of weakness among the men. There are more discontented ones and more who speak their discontent freely and aloud. It is said by some operators that they would have no difficulty in going to work at once if they would compromise with the men. Most of the companies and operators, however, are very determined, and it is probable that the men will yield first. Some idea of the state of the coal trade can be gathered from the fact that yesterday morning there was a considerable drop in coal shares resulting from a rumor that work had been resumed in the Wilkesbarre region. Delaware & Hudson fell from 5 1/2 to 4 7/8, D. & W. from 5 1/2 to 5, and so on.

In Trinity building dealers and agents remarked that an immediate resumption might cause a small break in Lehigh prices, to the extent of perhaps 15 or 20 cents. If, however, resumption does not take place until the 1st of October, the opinion prevailed that the present prices would be maintained. Lehigh Broken and Egg are quoted \$3.65; Stove, \$3.75; Chestnut, \$3.50. The Philadelphia and Reading prices are so high as to put this coal practically out of the market.

## PHILADELPHIA.

Office of The Iron Age, 220 South Fourth St., PHILADELPHIA, September 12, 1877.

Business has been generally very quiet during the past week, which in some degree seems to have shaken the confidence of those who were expecting an immediate resumption of old-time activity. In point of fact, it may be plainly stated that in nearly all departments of trade the past week was one of very general dullness and depression. Notwithstanding these little relapses, there is the utmost confidence in regard to the future, as it is well understood that it will be some months yet before the crops are marketed and the effects realized.

**Pig Iron.**—The market is not at all active, and although generally steady and firm, there are exceptional cases of weakness and consequent yielding in prices. The demand runs chiefly on special brands, and these are easily placed at full quotations. No large lots are sold, but orders are frequent, and there is therefore no accumulation of stock. Outside lots are not so easily placed, and there is a degree of irregularity and uncertainty in regard to these which to some extent affects the whole market. The past few days, therefore, have not developed any additional firmness—first, for want of an active market; and second, because of renewed anxiety by certain parties to realize on their product. As we said before, the leading and more favorite brands, under a steady demand and light stock, are firmly held, and on such no concessions can be obtained, but Iron of all grades can be had in quantity for prompt cash, at the lowest figures of the whole year. One of the leading buyers informs us that the purchases made by his firm have been at lower prices each month from January to date, the present month included. There is no doubt, however, that the trade is in a better position generally than it was some weeks since, and it is quite likely that the tendency will be toward further improvement. Buyers of small lots have to pay a little more money, and various trifling concessions that were made during the summer are not allowed now; even the best class of buyers find it increasingly difficult to place their orders at anything below regular quotations, and sales at extremely low prices are exceptional and not to be regarded as an indication of the general market. The demand, however, is very disappointing, and the volume of business shows no perceptible increase, in view of which it is surprising how steadily prices are maintained. The feeling in regard to the future is still one of confidence, and although no special change in values is looked for, it is probable the tendency will be slightly upward. In the meantime we quote the market steady at the following figures: No. 1 Foundry, \$18 to \$19; No. 2 Foundry, \$17 to \$17.50; Gray Forge, \$16.50, with special brands held at \$1 to \$1.50 per ton more.

**Plate and Tank Iron.**—The demand continues to be less active, and there are complaints of dullness and depression from all quarters. This branch of the Iron trade hitherto has been fairly active, and gave promise of being permanent, but the present outlook is quite discouraging. There are no important contracts on hand, and the mills are nearly all running on small orders received from day to day. Others are employed on making up stock, or are running only part. Under these circumstances competition is sharp, and prices somewhat irregular. We quote same as last week: Ship Plates, 2.37 1/2 c. to 2.50 c.; Tank Iron, 2 1/2 c. to 2 3/4 c.; Shell Iron, 3 c.; Flange Iron, 4 c. to 4 1/2 c., and Best Bloom, 5 1/2 c. to 6 c.

**Sheet Iron.**—The demand in some instances is reported less active, while others seem to be fully employed. There is probably a fair average business doing, but in small lots, which may or may not be permanent. For the time being business is satisfactory, but the outlook is not one of

absolute certainty, as buyers adhere closely to the plan of purchasing only as their needs may require. Caution seems to be a leading feature of the trade, and what business is done will be on a safe basis. If there is any genuine improvement in business it will be felt at the mills immediately, as dealers and consumers are not disposed to carry stocks. We quote for large lots: Refined Sheet Iron, No. 26 to 28, 3 1/4 c.; No. 22 to 24, 3 1/2 c.; No. 16 to 21, 3 3/4 c.; Best Bloom Sheets, No. 26 to 28, 5 1/2 c.; No. 22 to 24, 5 1/4 c.; No. 16 to 21, 5 c.; Common Red Plates, 5-16 to 18, 2 1/2 c. to 2 3/4 c.; Refined Plates or Blue Annealed, 5-16 to 18, 2 1/4 c.; American R. G., 5-16 to 18, 3 1/4 c.; Best Bloom, 5-16 to 18, 5 c.; A. Patent Planished, 11 c.; B. Patent Planished, 10 c.; Bloom Galvanized, 40 per cent.; Refined Galvanized, 50 per cent.

**Bar Iron.**—There is not the least improvement to note, and the demand is as light and unsatisfactory as ever. Competition, of course, is keen, and prices very irregular. Consumption is so light, however, and the requirements of buyers so trifling, that business is in a very small compass, and, as we remarked last week, cannot be forced by reducing prices. The experiment has been tried, both by our city manufacturers and Pittsburgh firms, but the result was only a further depression of prices, without any increase of business. Out of regard to the feelings of our Western friends we will forbear giving details, but we may say that the most alluring offers made by a representative of one of the leading firms failed to find the slightest response from buyers here. In fact, it is felt even among buyers that good Iron cannot be furnished at the prices at which it has been offered, and if common Iron can be substituted, it can be had in this vicinity quite as cheap as it can be furnished from distant points. In plain terms, it is not believed that a first-class quality of Iron can be sold for less than our quotations, and anything at a less price must be of a quality to correspond. We quote: Common Iron, 1.60 c. to 1.75 c.; and Best Refined, 2 c. to 2 1/2 c.

**Muck Bar.**—There is not much doing and prices are almost nominal. It is offered, Philadelphia delivery, at \$32 to \$34, according to quality.

**Steel Rails.**—There is no important change to note; there is a fair business doing in small lots, but no large transactions are reported. The outlook is considered favorable, and it is expected that sales will increase considerably within the next 30 days. In the meantime purchases are nearly all in lots of 200 or 300 tons each, for which full prices are obtained. Buyers of large lots for cash and prompt delivery would probably obtain some concessions, and although inquiries are numerous, they have not as yet led to much business. Some of the roads, it is believed will be compelled to purchase soon, as they are badly run down, and the prospects of a heavy traffic during the winter make it absolutely necessary for them to improve their roadway. It is quite likely, too, that some orders for large lots will be placed before winter, and in fact we hear of a sale of a 3000 ton lot to-day at a price not named, but in all probability at something less than regular quotations. We quote about \$44 to \$45, cash, at mills, as the basis of late sales. Street Rails, \$53 to \$55.

**Iron Rails.**—There has been very little new business done, the only sale reported being a lot of 200 tons. There are several orders in the market, including one from Cuba, but as yet they have not offered sufficient inducement to attract the favorable consideration of sellers. With a general improvement in trade, it is quite likely that the Iron Rail mills will realize a better demand for their products. We quote according to section, quality and terms, \$31 to \$35, cash, at mills. Some sales of Street Rails are reported; terms private.

**Old Rails** are offered freely at \$10, and in one instance we know of them being refused at \$18.50. Sales reported are at \$18.50 to \$19, with sellers at same prices. The demand is light, however, and the tendency of the market is toward lower prices. We quote \$18.50 to \$19.50 as covering the whole market. Sales of old Street Rails at \$22.

**Old Car Wheels.**—There is scarcely any demand, and prices are nominal at \$18.50 to \$19.50, last sale reported being \$19.

**Old Car Axles.**—No recent sales reported, although buyers are in the market at low prices. Sellers hold at \$26 to \$28, according to make.

**Scrap Iron.**—There is no change to note, but the market is very dull, and the demand light. We quote as before: Wrought \$22 to \$23; Cast \$15 to \$16.50.

**Nails.**—The demand is quite satisfactory and prices are generally steady and well maintained, although there are rumors of cutting. Some large sales are reported—one firm alone will ship nearly 30 cars this week. We continue our quotations of last week, \$2.40 to the trade, and \$2.50 to consumers.

**Lead.**—The demand is still very light and prices are dropping, say \$1.00 to \$1.25 for Common, and \$5.15 to \$5.20 for Refined. Manufactured is in good demand, and Shot unusually active. We quote Bar, 7 c.; Pipe, 7 1/2 c.; and Sheet, 8 c. Shot—Drop, 8 1/4 c. to 9 1/4 c.; Buck, 9 3/4 c. to 10 3/4 c., all less 10 per cent. to the trade.

## PITTSBURGH.

Office of The Iron Age, 77 Fourth Avenue, PITTSBURGH, Sept. 11, 1877.

**Pig Iron.**—There is more doing, and rumors prevail of some few small lots having changed hands, but the inquiry, as a rule, is still for small lots, to supply immediate wants, and the probability is that buyers generally will adhere to this policy for some time to come. Sales of large lots can only be effected by offering inducements, and in the present condition of affairs there is no incentive on the part of consumers to anticipate future wants, unless concessions below current rates are offered, as there is no probability of any immediate advance, and a possibility of a further depreciation, notwithstanding the general belief that hard pan has been touched. The very best brands of Western Gray Forge Red Short cannot fairly be quoted above \$20.00 to \$20.50, 4 months, which barely covers actual cost of production, re-

ducing the latter down to the very lowest limit; and only those in need of money will sell the grade below, or even at the figures named. Moreover, it is not expected by producers that the cost of production can be reduced any further; fuel, if anything, is higher, while ore and labor—the latter in particular—are down to the lowest notch. However, notwithstanding the production is down lower now, possibly, than it is still, there is reason to believe, in excess of the consumption, which is exceedingly light, as compared with what it usually is at this season of the year, and then the using of so many old rails has largely curtailed the consumption of pig, the former being so much cheaper than the latter. Bituminous Coal, smelted from Lake Superior ore, may be fairly quoted as follows: No. 1 Foundry, \$25.50, 4 months; No. 2 do., \$21.50; Gray Forge, \$20.50 for red short, and \$18 to \$19 for cold short and neutrals. Rumored sale of 1,500 tons of mixed red short at \$17 cash. The Lucy Furnace Co. will start up an additional furnace; the "Soho" (Moorhead & Co.) will be started up very soon. The Isabella has been running one furnace for some time past.

**Manufactured Iron.**—Business continues backward, and while most of the mills are running, very few if any of them are working up to anything like their full capacity. Many of the puddling furnaces have not yet been lighted up, most of the mills having a stock of muck bar, accumulated before stopping in July, while others have been using more or less old rails, and this accounts for the very light consumption of pig iron alluded to elsewhere. The firmness manifested on the part of manufacturers, noted in our last report, still continues. This feeling has been more apparent since the taking of stock, and it is evident that mill men have sensibly concluded that it is better to do nothing than to work at a loss, and this stiffening has no doubt had considerable to do with the very light demand, as orders could be placed at lower rates elsewhere. It is reported on very good authority that the mills in the Shenango and Mahoning valleys have also stiffened up recently, and are now refusing orders at prices current there a few weeks ago. There is no question but these mills within the past few months obtained considerable trade at the expense of Pittsburgh, but the probability is that they have learned since the taking of stocks that the more orders they obtained at the prices they took them at the less money they would have. Notwithstanding all that has been said about Pittsburgh having lost her prestige as being the great iron mart of the country, she is still able to meet competition, and in regard to quality her product will stand the most critical test with that of any other point. It is true that some of our manufacturers, in order to satisfy the clamor for something cheap, have used more or less old rails; but others, jealous of their reputation, have refused to let an old rail be seen about their mills. We continue to give 1.80 c. to 1.90 c. as the base price, with some few makers at 2 c.

**Nails.**—There has been no perceptible change in the situation since the date of our last report; nearly all the factories, including those of Shoenberger & Co., Zug & Co., Chess, Smyth & Co. and Lewis, Dalzell & Co. are running, and operations have also been resumed by most, if not all, the Wheeling makers. Stocks are known to be light both in hands of jobbers and consumers, and the prospect is still regarded favorable for a good fall trade. No change in prices; \$2.25, 60 days, for 200 kegs and upward; ten cents additional for smaller lots, and the usual discount of two per cent. for cash. There is to be a regular meeting here to-morrow of the Western Association, and an advance in prices is not improbable; if so the readers of The Iron Age will be advised of it by wire.

**Horse and Mule Shoes.**—There is a fair degree of activity, as there usually is in this branch of the trade, but no change in prices. Shoenberger & Co. continue to quote at \$3.80 and \$4.80 for 100 keg lots. Special rates for larger lots. In former years it was customary with the jobbing trade to stock up about twice a year, but this year they do not seem disposed to anticipate future wants; hence business is not as active as it should be at this particular time.

**Wrought Pipe.**—Some manufacturers are reported as being pretty well supplied with orders, but there is no uniformity of prices, each firm or company making their own rates, and the trade in this particular respect is by no means satisfactory.

**Steel.**—The general position of the market for this important article remains substantially the same as noted in our last report; the demand keeps up well, the best evidence of which lies in the fact that the mills are generally busy, and no doubt is entertained but this will continue to be the case until the close of the year. As frequently stated in these reports, the consumption of Steel is rapidly increasing; in consequence of its cheapness it is supplanting Iron for many purposes; and another effect of the low prices is to almost entirely stop importations from foreign countries. Nearly all the railroads are now putting down Steel instead of Iron rails, and this accounts for the fact that while the consumption of Steel has been steadily increasing for several years past, that of Iron has been falling off.

**Scrap.**—There have been no recent sales of old rails, and the market continues very dull, for while there is no disposition to press sales, there are a good many on the market, and prices continue to rule in buyers' favor; the great objection is that they run even, and but for this the consumption here would be considerably larger than it is. Prices may be quoted at \$19 to \$20, 4 months, at which rates they are much cheaper than Pig Iron, but manufacturers, for the reasons stated, are afraid of injuring the quality of their product. Old Car Wheels are still quoted at \$20 to \$21 per gross ton; No. 1 Railroad Scrap, \$24 per net ton.

**Coke.**—The trade is generally reported dull, and no material improvement can reasonably be expected while the Pig Iron market continues in its present depressed condition. The consumption here will be increased somewhat within the next week or two by the starting up of some additional

furnaces; but there is no prospect of any improvement in prices, which, like those for Pig Iron, are unremunerative. Connellsville is quoted at \$1 per ton at mines and \$2 to \$2.50 delivered free on cars in Pittsburgh. Pig Iron furnaces, by taking large quantities, can buy at \$2 per ton, delivered here.



are more interested in others besides farmers. They set forth that in Great Britain and Ireland the wheat crop consists of 3,311,859 acres, which is more than in 1876 by 166,202 acres, but less than in 1875 by 189,617. The acreage under barley is 2,643,511 acres, being less by 110,412 acres than in 1876, and less by 100,093 acres than in 1875. The acreage under oats is 4,225,877 acres, or less by 59,719 acres than in 1876, but more by 60,001 acres in 1875. The acreage under potatoes this year is 1,383,093 acres, or less by 1,811 acres than in 1876, and less by 39,246 acres than in 1875. The number of cattle in the United Kingdom in June, 1877, was found to be 9,603,307, which is less by 270,435 than in 1876, and less by 434,805 than in 1875. The number of sheep is 32,157,903, or less by 24,115 than in 1876, and less by 1,263,472 than in 1875. The number of pigs is 3,066,588, or more by 247,996 than in 1876, and more by 484,684 than in 1875. The returns for Ireland show also its number of horses, which is increasing, and amounts now to 552,762, or 47,678 more than in 1876; the 266,755 goats also show some increase, but the poultry in Ireland, 13,549,326 in 1877, are fewer by 68,074 than in 1876. The population of the United Kingdom is estimated at 33,444,410 in the middle of the







# SAM'L G. B. COOK & CO.,

American and Foreign  
Hardware and Cutlery Manufacturers'  
Agents,

Nos. 5 & 7 German St., - - BALTIMORE.

Represent and carry in stock a full line of the following manufacturers' goods, which we offer the Trade at manufacturers' prices and terms.

**American Screw Co.,** Screws.  
**American Tea Tray Co.**  
**John Auer & Co.,** Wrought Goods.  
**Branford Lock Works.**  
**Beardsley Seythe Co.**  
**Bailey Tool Co.,** Defiance Iron Planes.  
**Carr, Crawley & Devlin,** Building, Cabinet and Saddlery Hardware.  
**Clark & Co.,** Patent Blind and Gate Hinges.  
**Cowles Hardware Co.,** House Furnishing and other Hardware.  
**Clark Bros. & Co.,** Carriage, Tire and other Bolts.  
**Connecticut Cutlery Co.,** Pocket Cutlery and Trimmers.  
**H. Chapin's Son,** Rules, Levels, etc.  
**John Chatillon & Sons,** Balances.  
**L. Coes & Co.,** Patent Screw Wrenches.  
**A. Field & Sons,** Tacks, Nails, etc.  
**Goodell Co.,** Apple, Peach and Potato Parers.  
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**Iowa Farming Tool Co.,** Handled Hoes and Rakes, Snaths, etc.

**Kimball Shovel Co.,** Solid Cast Steel Shovels and Spades.  
**Klein, Logan & Co.,** Picks, Mattocks, Grub Hoes, Fire Shovels, etc.  
**Henry W. Kip, C. S. Hammers.**  
**Launcester Bolt Co.,** Eagle Carriage and Tire Bolts.  
**Lamson & Goodnow Mfg. Co.,** Table Cutlery, Butcher Knives, etc.  
**Meriden Britannia Co.,** Plated Ware and Britannia Spoons.  
**W. T. & J. Mersereau,** Stair Rods, etc.  
**Wm. McNiece,** Saws.  
**Nicholson File Co.**  
**National & Southern Horse Nails.**  
**Northwestern Horse Nail Co.**  
**Peck Bros. & Co.,** Brass Cocks.  
**A. G. Patton,** Enameled and Tinned Hollow Ware.  
**Rogers Bros.,** "At 1847" Plated Spoons, Forks, &c.  
**James R. Torrey's** Razors and Straps.  
**U. S. Lock Co.,** Shepherdston's Patent Locks.

And other manufacturers, making our assortment of

## Builders', Cabinet, Agricultural and House Furnishing Hardware & Cutlery.

As complete as can be found in any house. Also full stock of  
Wostenholm's, Rodgers', Field & Co., Continental and German Cutlery,  
W. & S. Butcher's Razors, Edge Tools and Files.

Full line of

## REVOLVERS AND CARTRIDGES.

And a general assortment of

## SHELF AND HEAVY HARDWARE.

Orders filled promptly from stock.

Consignments of desirable goods solicited.

## JOB T. PUGH'S Celebrated AUGERS and BITS.

They are made entirely by hand, and are especially adapted to hard wood. Supplied to the trade only. Gas Fitters', Millwrights', and Carpenters' Augers and Bits. Machine Bits of all descriptions made at short notice.

Office and Works,  
Rear of Nos. 3112, 3114, 3116, 3118 & 3120 Market Street, Philadelphia, Pa.

**THE CONNECTICUT VALLEY MFG. CO.,**  
CENTERBROOK, CONN., Manufacturers of  
**Lewis' Patent Single Twist Spur Bits,**  
**GERMAN CIMLET BITS, etc.**

## GEER'S AIR CUSHION DOOR SPRING

Will shut any door, light or heavy,  
WITHOUT SLAMMING.  
Twenty-four times as much force exerted when the door is closed than at the wide open point.



Circulars sent on application.

Manufactured by

**The Cowles Hardware Co.,**  
UNIONVILLE, CT.

**THE AMERICAN WIRE NAIL CO.,**  
Manufacturers of  
**Molding, Trimming, Upholstering & Finishing Nails,**  
**Escutcheon Pins and Wire Nails**  
Of all kinds and sizes, with Flat, Oval, Depressed, or Countersunk Heads, with or without points  
Warranted Well Made and of Superior Quality.  
Lock Box 853. OFFICE AND WORKS, Covington, Ky.

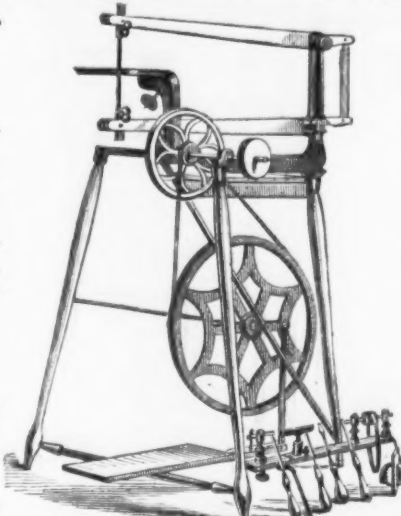
# LESTER SAW.

This Machine is the result of combining all the qualities which the best practical experience thus far has been able to name as the requisites of a perfect Amateur Tool. While it is as cheap as the cheapest, it certainly is as good as the best. It consists of a Scroll Saw with tilting table for inlaid work, and patent clamps into which a saw can be inserted in the dark. A Turning Lathe, with a complete set of best steel turning tools, Emery Wheel with wide well built and will do good work. A box is attached to each machine for holding the small tools. When shipped it is taken down and packed in a small compass. It is only the work of a few moments to put it up again in working order. Price, complete, \$8.00. Without the Lathes, \$6.00.

## DESCRIPTION OF THE SEVERAL PARTS.

**THE SCROLL SAW.**  
Length of arms.....20 1/2 in.  
Length of sweep for work.....17 "  
Height of table above floor.....31 "  
Diameter of table.....6 "  
Length of stroke.....1 1/2 "  
Diameter of driving wheel.....12 "  
Diameter of balance wheel.....6 1/2 "  
Diameter of emery wheel.....3 1/2 "  
Number of strokes of saw per minute.....1,000  
Number of revolutions of emery wheel per minute.....1,000  
These speeds are made with a tread of 150 per minute.  
Weight of Scroll Saw, 30 lbs.

**THE LATHE.**  
Weight.....6 1/2 lbs.  
Length of ways over all.....15 1/4 in.  
Distance between centers.....9 "  
Swing.....3 "  
Length of slide rest.....4 1/2 "  
Height of head and tail stocks above ways.....2 1/2 "  
Diameter of cone pulley.....1 1/2 "  
Number of revolutions per minute.....7,000



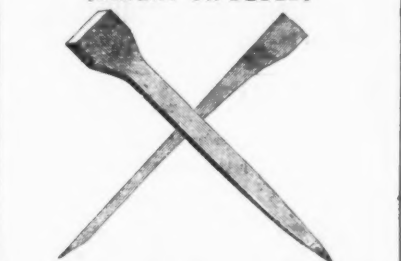
## THE CIRCULAR SAW.

Diameter of saw.....3/4 in.  
Length of saw arbor.....2 1/4 "  
Height from floor to table.....33 "  
Size of table.....4x5 1/2 "  
Number of revolutions per minute.....7,000  
Weight.....1/4 lb.

Total Weight of Combination,  
36 3/4 lbs.

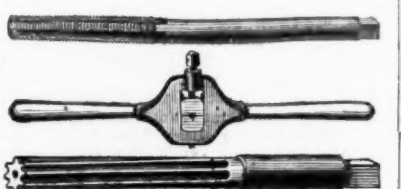
**MILLERS FALLS CO.,**  
No. 74 Chambers Street,  
NEW YORK.

## NATIONAL Horse Nail Co. MANUFACTURERS OF FINISHED [BRIGHT OR BLUED]



These nails are made of the best brands of NORWAY IRON, and are guaranteed to be equal to any in the market.

**NATIONAL HORSE NAIL CO.,**  
VERGENNES, VT  
HORACE DURRIE & CO., Agents,  
No. 97 Chambers St., New York



**H. PRENTISS & CO.,**  
Sole Manufacturers of  
GODDARD'S PATENT-RELIEVED  
Machinists' and Gas Fitters'  
TAPS,  
AND SOLID REAMERS,  
Machinists' Supplies.  
E. A. GODDARD,  
Late N. Y. Tap & Die Co.,  
General Sales Agent, 14 Day Street, New York.  
Send for Price List.

**THE WORLD'S STANDARD  
FAIRBANKS  
SCALES**  
RECEIVED HIGHEST MEDALS AT  
World's Fair, London.....1851  
World's Fair, New York.....1853  
World's Fair, Paris.....1867  
World's Fair, Vienna.....1873  
World's Fair, Santiago (Chile).....1875  
World's Fair, Philadelphia.....1876  
World's Fair, Sydney, Australia.....1877  
Also Sole Agents for  
MILES' ALARM MONEY DRAWERS,  
HANCOCK'S INSPIRATORS,  
(The Best Feeder known for Stationary, Marine and Locomotive Boilers.)  
Also,  
OSCILLATING PUMP CO.'S PUMPS.  
**Fairbanks & Co.,**  
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**Steel Castings,**  
Light and heavy Steel Castings of superior metal, solid and homogeneous. All work guaranteed. Send for circular.  
**EUREKA CAST STEEL CO.,**  
Chester, Pa.  
Office: 307 Walnut St., Phila.

## L. COES' Genuine Improved Patent SCREW WRENCHES.



Manufactured by  
**L. COES & CO.,**  
Worcester, Mass.



We invite the particular attention of the trade to our New Straight Bar Wrench, widened, full size of the larger part of the so called "reinforced or jog bar." Also our enlarged jaw, made with ribs on the inside, having a full bearing on the front of bar (see sectional view), making the jaw fully equal to any strain the bar may be subjected to.

These recent improvements in combination with the nut inside the ferrule firmly screwed up flush, against square, solid bearings (that cannot be forced out of place by use), verifies our claim that we are manufacturing the strongest Wrench in the market.

We would also call attention to the fact, that in 1869 we made several important improvements (secured by patents), on the old wrench previously manufactured by L. & A. G. Coes which were at once closely imitated and sold as the Genuine Wrench by certain parties who seem to rely upon our improvements to keep up their reputation as manufacturers, and although the fact of their imitating our goods may be good evidence that we manufacture a superior Wrench, we wish the trade may not be deceived on the question of originality. Trusting the trade will fully appreciate our recent efforts, both in improvements on the Wrench and in the adoption of a Trade Mark, we would caution them against imitations. None genuine unless stamped

"L. COES & CO."

Warehouse, 97 Chambers St., & 81 Reade Sts., N. Y.  
**HORACE DURRIE & CO.,** Sole Agents.



**C. S. OSBORNE & CO.,**  
MANUFACTURERS OF  
**Gas Pliers, Pipe Tongs, etc.)**  
NEWARK, N. J.

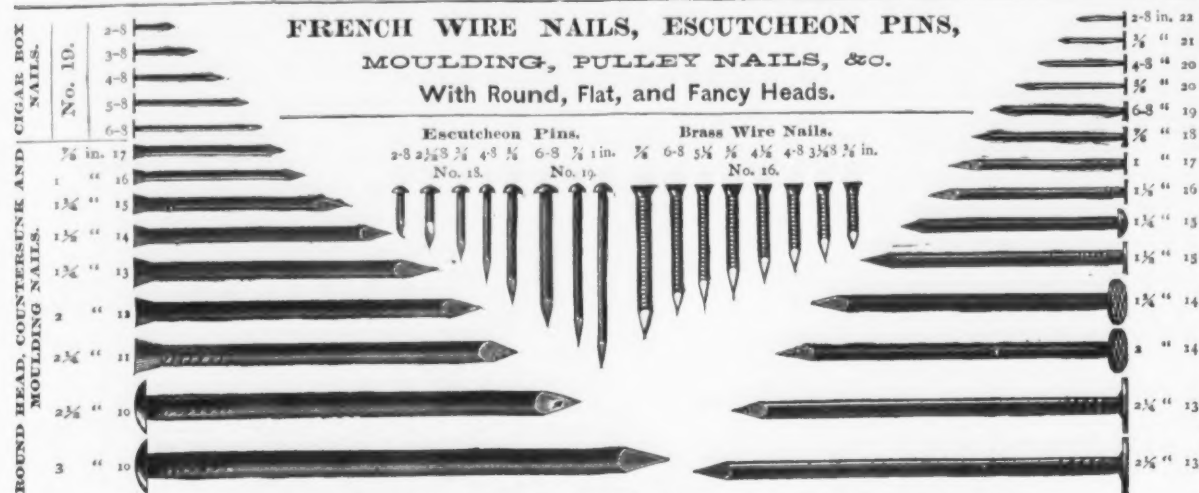
**The Hartford Foundry & Machine Co.,**  
Successors to the WOODRUFF & BEACH IRON WORKS,  
MANUFACTURERS OF  
**Marine & Stationary Engines, Mill Gearing  
Hoisting and Mining Machinery.**  
**PUMPING ENGINES,** for City and Town Supply a Specialty.  
60 to 96 Commerce Street, HARTFORD, CONN.



# HOBART'S TACKS

MANUFACTURED BY  
**DUNBAR, HOBART & WHIDDEN,**  
ESTABLISHED 1810.

Office and Salesroom, 116 Chambers Street, New York. . . . Factory, South Abington, Mass.

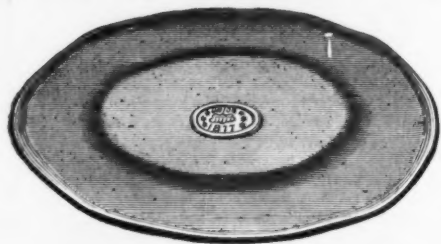


Any Kind of Wire Nails made to order from Description, or Samples.

## American and Swedes Iron Tacks,

Tinned, Leathered and Large Head Carpet Tacks, Finishing Nails, Black and Tinned Trunk Nails, Miners' Copper, Gimp, Lace and Brush Tacks, Hungarian, Chair, Cigar Box and Barrel Nails, Glaziers' Points, Iron, Steel, Copper and Zinc Shoe Nails, Patent Improved Brass Shoe Nails, Heel and Toe Plates, Steel Shanks, and Fancy Head Nails, Silver or Japanned Lining and Saddle Nails, A full assortment always on hand at salesrooms, for immediate delivery if required. Odd and Irregular Sizes made to order or cut from sample at short notice. Send for Price List.

## THE UNION STOVE BOARD.



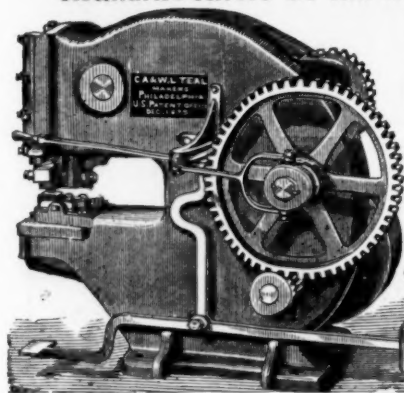
PLAIN AND SHEET IRON LINED.

The cheapest and most durable Stove Board ever offered to the trade. Send for price list, stating quantities wanted.

**F. HABERMAN, Manufacturer,**  
294 Pearl Street, NEW YORK.

## C. A. & W. L. TEAL,

Manufacturers of IMPROVED BENDING ROLLS



Arranged for Removing Work from the end of top roll.

**COMBINED**  
Punching & Shearing Machines,  
With "Automatic Stop motion,"  
Adjustable to any point of the stroke.

Single Power Punching Machines,  
With Shearing Attachments.

Steam Riveting Machines,  
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ing & Cleaning Machines, and

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WITH WOOD OR IRON WHEELS.

A first-class article and a specialty, that will make a demand in any market and afford a good margin to dealers. We are prepared to furnish them in large quantities. Manufactured by

**BRYAN MANUFACTURING CO., Bryan, O.**  
**SEMPLE & BIRGE MFG. CO., Sole Western Agents, ST. LOUIS, MO.**  
For Sale by THE NEW YORK FLOW CO., General Eastern Agents, 95 Beekman St., New York.



Established 1838  
**Bevin Bros. Mfg. Co.,**  
Easthampton, Ct.,  
Manufacturers of  
**SLEIGH BELLS**  
House, Tea, Hand,  
Gong Bells, &c.  
Bell Metal Kettles.

**Lester Oil Co.,**  
31 MAIDEN LANE, N. Y.  
Exclusive manufacturers of the Renowned

**Synovial Lubricating OILS.**

The most Durable, Reliable & Economical Lubricant in existence;  
& applicable to every grade of machinery. Send for Circular and Price List.

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**Jas. Ostrander & Son,**  
Established 1848.  
Manufacturers of  
**FIRE BRICK,**  
Tuyeres, Tiles, Blast Furnace  
Blocks, etc.  
Miners and Dealers in  
Woodbridge Fire Clay and Sand,  
and Staten Island Kaolin.  
Price List, Diagrams of Fire Brick,  
and all other information cheerfully  
furnished on application.  
TROY, N. Y.  
JAMES OSTRANDER,  
FRANCIS A. OSTRANDER, Surviving  
partner.

## CUMBERLAND FIRE BRICK WORKS

**GARDNER, STUART & CO.,**

MANUFACTURERS OF

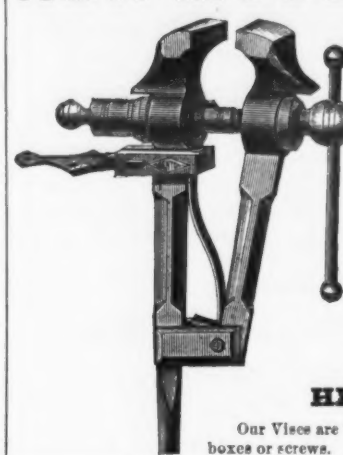
## STANDARD SAVAGE FIRE BRICK.

OFFICE: Room 3, No. 96 1/2 Fourth Avenue, PITTSBURGH, PA.

WORKS: One Mile from Mt. Savage Junction, Md., B. & O. R. R.

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## NEW MODEL SWIVEL VISE.



The advantage claimed for this Vise over the ordinary patterns is in the ease with which it is adjusted to whatever angle may be required.

## Trenton Vise & Tool Works

TRENTON, N. J.,

Manufacturers of

Solid Box Vises, Hammers, Sledges, Picks,  
Mattocks, Grub Hoes, &c.

Warehouse,

101 & 103 Duane Street, NEW YORK.

**HERMANN BOKER & CO.**

Our Vises are warranted to do more work than any other make. No broken boxes or screws.

## Harvey W. Peace, Vulcan Saw Works.

Manufacturer of every kind of

## Patent Ground SAWS.

Union Avenue, Tenth and Ainslie Streets, BROOKLYN, E. D., N. Y.



Circulars, Cross-Cuts, Mill,  
Muley, Gang, Hand,  
and Butcher.

Molding and Planing Knives,  
Plastering Trowels, Miter-  
ing Rods, &c.

## E. M. BOYNTON,

Manufacturer of all kinds of

First-Class Saws, Saw Frames, Cross-Cut Handles, Tools, Files, &c.  
Also Sole Proprietor and Mfr. of the Genuine Patent Lightning Saw,  
No. 80 Beekman Street, NEW YORK.

Special attention is called to my new Centennial Saw, patented March 28th, 1876; Special File and Saw-Set combined, patented June 30th, 1876; Cross Cut (Loop) Saw Handle, patented February 15th, 1876; New One-Man Saw, with Patent Double Removable Handle Attachment, March 28th, 1876; New Patent Champion Clearer Tooth, patented August 15th, 1876; Saw Set, patented Nov. 25th, 1873—a perfect Set that a blind man can use to condense like a Hammer Set perfectly; Cross-bar Wood Saw Frame, patented Nov. 12, 1872; also Cross-Cut Handle, with castings, patented Feb. 13, 1870. These goods complete the scientific tools for cutting timber, instead of wearing it off with notched V teeth (which are like a fractured plate sharpened).



AWARDED CENTENNIAL MEDAL AFTER ACTUAL TEST.

REPORT ON AWARDS. PHILADELPHIA, November 11th, 1876.  
Product: Saws in great variety; special improvement in shape of teeth, called Patent Lightning Saw.  
Name and Address of Exhibitor: Eben Moody Boynton, New York.  
The undersigned having examined the product herein described, respectfully recommends the same to the United States Centennial Commission for award, for the following reasons, viz:  
Report: "Being of very Superior Quality and of great Practical Utility."  
Signature of the Judge.  
J. D. IMBODEN, of Virginia, CHARLES STAPLES, of Maine, G. L. REED, of Penn.,  
J. DIFENBACH, of Germany, DAVID McHARDY, of Scotland, D. STEINMETZ, of Phila. Judges.  
A true copy of the record. FRANCIS A. WALKER, Chief of the Bureau of Awards.  
Given by authority of the U. S. Centennial Commission.  
J. L. CAMPBELL, Sec'y. A. T. GOSHORN, Director General. J. R. HAWLEY, Pres.

## Wheeler, Madden & Clemson

**MFG. CO.,**

MIDDLETOWN, . . . . NEW YORK.

Manufacturers of

WARRANTED CAST STEEL

## SAWS

Of every description, including

Circular, Shingle, Cross-Cut, Mill, Hand,  
**WOOD SAWS. Etc., Etc.**

## AMERICAN SAW CO.,

Manufacturers of

Movable Toothed Circular Saws,  
**PERFORATED CROSS-CUT SAWS**  
And SOLID SAWS of all kinds. Trenton, N. J.

## NEWTON & CO.,

Successors to

**PALMER, NEWTON & CO.,**

ALBANY, N. Y., Manufacturers

## FIRE BRICK

Stove Linings,  
Range and Heater Linings

Cylinder Brick, &c., &c.

**Watson Fire Brick Manufactory**  
ESTABLISHED 1836.

**JOHN R. WATSON, Perth Amboy, New Jersey**  
Manufacturer of

**FIRE BRICK,**

For Rolling Mills, Blast Furnaces, Foundries,  
Gas Works, Lime Kilns, Tanneries, Boiler  
and Grate Setting, Glass Works, &c.  
FIRE CLAYS, FIRE SAND, AND KAOLIN FOR SALE

**M. D. Valentine & Bro**  
Manufacturers of

## FIRE BRICK

And Furnace Blocks  
DRAIN PIPE & LAND TILE.

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**HENRY MAURER,**

Proprietor of the

**Excelsior Fire Brick & Clay**  
Retort Works,

Manufacturer of FIRE BRICK, HOLLOW  
BRICK AND CLAY RETORTS.

WORKS: PERTH AMBOY, NEW JERSEY.

Office & Depot: 418 to 422 East 23d St., N. Y.

**B. KREISCHER & SON,**

New York Fire Brick &

STATEN ISLAND

CLAY RETORT WORKS,

Established 1845.

Office, foot of Houston Street, East River,  
NEW YORK.

The largest stock of Fire Brick of all shapes and  
sizes on hand, and made to order at short notice.

Cupola Brick, for McKenzies Patent,  
and others. Fire Mortar, Ground Brick, Clay and  
Sand. Superior Kaolin for Rolling Mills and Found-  
ries. Stone Ware and other Fire Clay and Sand  
from my own mines at New Jersey and Staten Island  
by the cargo or otherwise.

**Brooklyn Clay Retort**

AND

**FIRE BRICK WORKS.**

Manufacturers of Clay Retorts, Fire Bricks, Ga-  
House and other Tile, Cupola Brick, &c. Dealers in  
and Miners of Fire Clay and Fire Sand. Clay bank at  
Burt's Creek, New Jersey. Manufactory: Van Dyke,  
Elizabeth, Richards and Partition Sts., Brooklyn, N. Y.  
Office: No. 88 Van Dyke St.

**MANHATTAN FIRE BRICK**

and Enamelled Clay Retort Works.

**ADAM WEBER, Proprietor.**

Office, 633 E. 15th St., N. Y. Clay Retorts, Enam-  
elled for Gas Houses: Retorts for burning raw bone and  
re-burning bone for Bone Black. Fire Bricks, Fire  
Blocks, Cupola and Range Bricks of all shapes and sizes.  
The best fire clay from my own Clay beds at Perth  
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**A. HALL & SONS, Perth Amboy, N. J.**

ESTABLISHED 1846.

**HALL & SONS, Buffalo, N. Y.**

ESTABLISHED 1866.

**FIRE BRICK**  
of reliable quality for all purposes, manufactured of  
the best New Jersey Fire Clay. Also, Architectural  
Terra Cotta, Fire Clay, Fire Sand, Kaolin, Ground Fire  
Brick and Diamond Building Brick.



# HOTCHKISS' PATENT "SUPERIOR" CURRY COMBS.

We invite the special attention of the trade to our

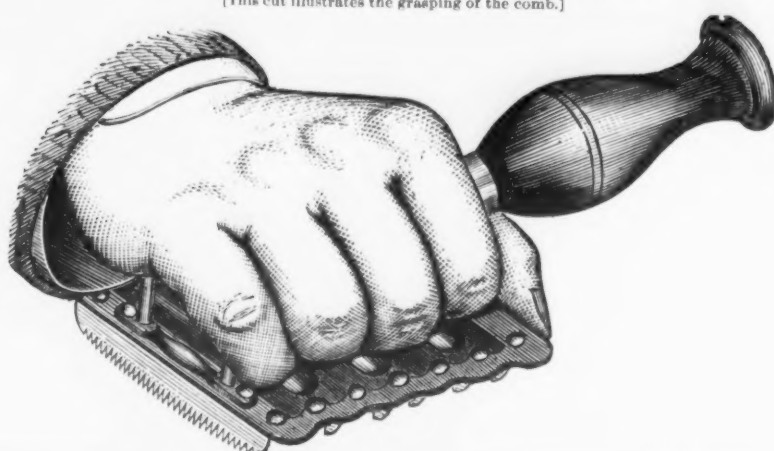
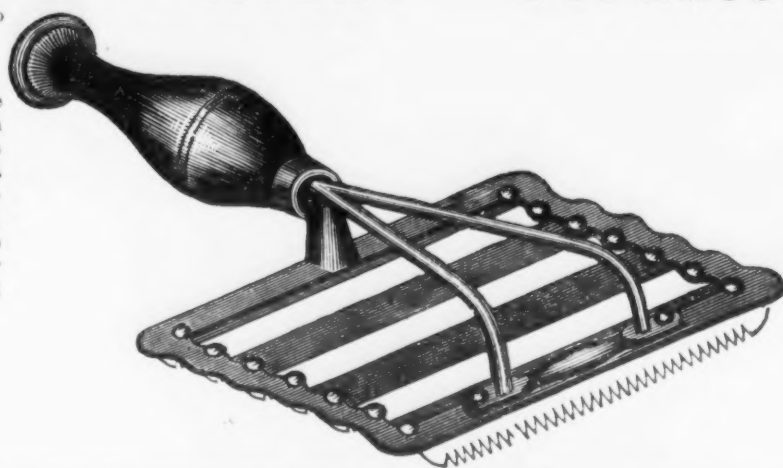
Patent "Superior" Curry Combs, which are the *best* and *most complete* side handle combs having a grasp over the back now in existence, and which for *neatness, strength* and *durability* have no equal. Give them a trial, and you will be convinced they are *superior* to any Curry Comb in the market. They are neatly put up in paper boxes of one dozen each, and packed 15 dozen in a case. For sale by the Jobbing Hardware, Saddlery and Wooden Ware trade.

**HOTCHKISS' SONS,**

Bridgeport, Conn.

SAMPLE AND WAREHOUSES,

113 Chambers Street, N. Y.



[This cut illustrates the grasping of the comb.]

## J. L'HOMMEDIEU'S and WATROUS & CO'S SHIP AUGERS, AUGER BITS, TRENAIL AUGERS, Etc.



Ship Augers, With Screw.

Ship Augers, without Screw.

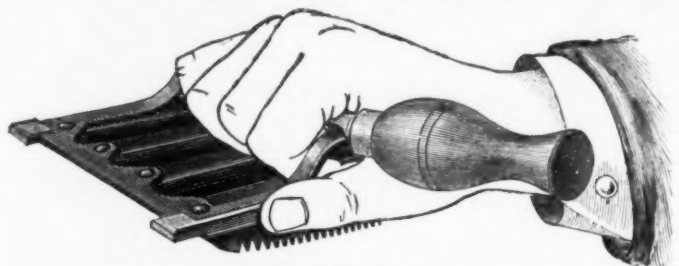
Nobles Mfg. Co.'s Double Spur Auger Bits.

In connection with our other goods, such as the **BROOK'S EDGE TOOL CO., SNELL MFG. CO., DAVIS LEVEL & TOOL CO.,** and **P. MERRILL'S CHISELS,**

We are the Sole Agents for, and take the entire production of, the following factories:

**J. L'Homedieu Ship Auger Works, Watrous & Co.'s Ship Auger Works, Nobles Mfg. Co., manufacturers of Extra Double Spur Auger Bits, Augers, Braces, Adjustable Handle Drawing Knives, Etc.**  
**C. E. JENNINGS & CO., 98 Chambers Street, New York.**

## THE POPULAR CURRY COMB



Patent applied for.

A FULL LINE OF NEW CURRY COMBS.

Packed 1/4 doz. in strong paper boxes, 24 doz. in Wooden Cases. Send for price list.

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Wiebusch & Hilger Hardware Co., New York, Agents for the United States.

## D. W. HAZLETON & CO

724 Girard Ave., Philadelphia

Manufacturers of

**Curry Combs**

Galvanized Square and Ornamental

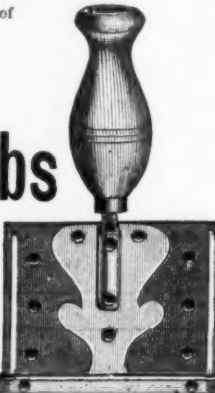
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RIBBED TUBING

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Work to order.

Correspondence Solicited.



## DUPLIX Curry Comb



We call the attention of Hardware Dealers to our Double Curry Comb, comprising a fine and coarse side; or virtually two combs in one. It is useful, durable and needs no argument to convince any one of its practicality. It sells on sight and is bound to supersede all other combs. We want one reliable dealer in each state or large city to handle it. Correspondence solicited. Address

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## BALDWIN'S Premium Mangle

Guaranteed to perfectly perform all work. Either steam or hand power. Cold or steam heated. Rolls. Cheap, durable, highly recommended.

National Home for Disabled Vol. Soldiers, Eastern Branch.

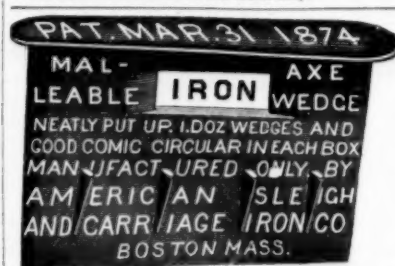
Toots, Md., August 4, 1877. Standard Laundry Machinery Co.—GENTLEMEN: It gives me pleasure to state that one of your "Baldwin Steam Mangles" has been used in our laundry for several months, and has thus far given entire satisfaction, being simple well made and easily run.

Yours, truly, **WM. S. TILTON, Dep. Gov.**

For circulars apply to **Standard Laundry Machinery Co., 32 Dey Street, New York.** 58 Long Wharf, Boston.



Patented July 31, 1877. For sale at all the principal Hardware Houses in New York and elsewhere, also in the Manufacturer's Office, 24 Dey St., New York. Price Lists furnished to the trade only.



Price, \$4.50 per gross; one sample by mail, 10 cents; one each size (three sizes) by mail, 20 cents. one dozen by mail, 60 cents. For sale by wholesale dealers in Boston, New York, Philadelphia, Chicago and St. Louis.

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81 Beekman St., New York.

To close the business we are now offering our entire

Merchandise Stock at less than Market Rates.

Buyers are invited to call and examine our stock, or write us for particulars before purchasing elsewhere.

**Special Inducements to Cash Purchasers.**

The COMMISSION Department of our business has been transferred to

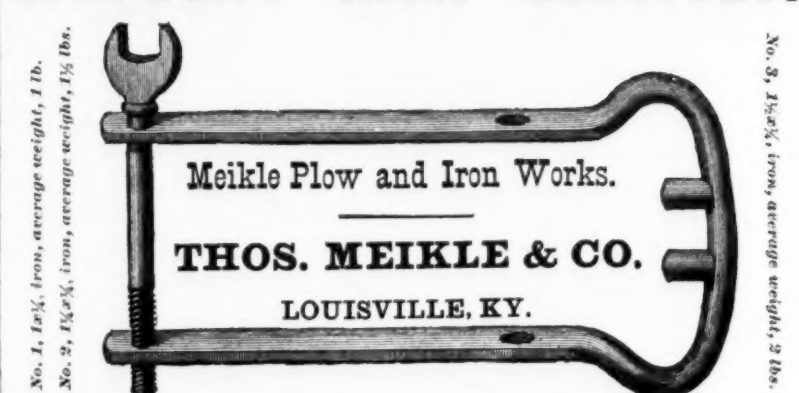
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Price Lists furnished on application.

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MADE OF ROUND EDGE CHARCOAL IRON ROLLED TO ORDER.



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The "Boss" is the most perfect Funnel Hod in the market. It is so constructed that the mouth of the Hod cannot become filled in discharging. The styles, sizes and prices are as follows:

15 inches, per doz.	16 "	17 "	18 "
\$4.35	\$5.00	\$5.65	\$6.35
\$5.00	\$5.75	\$6.50	\$7.25
\$5.65	\$6.40	\$7.15	\$7.90
\$6.35	\$7.10	\$7.85	\$8.60

NET PRICES.

Special discounts made for quantities on application.

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## SAUSAGE MEAT CHOPPERS.

Kinyon's Patent, the "BOSS,"

3 Power Sizes,

4 Hand Sizes.

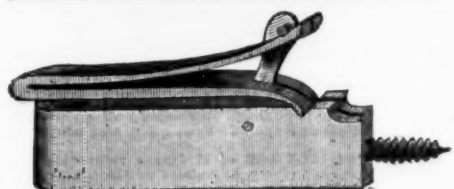
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This is the greatest invention of its kind in the market. Can be worked from either right or left side. I sell to dealers the treadle and shafting only, or fancy frames with treadle and shafting complete (with-out stone).

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This stop is stronger than any in the market, and is a perfect stop.

All kinds of Machine Patterns made to order. Special attention paid to Mechanics' Tools and Patent Office Models. **WORKS: COR. SECOND & CENTRAL AVENUES, CINCINNATI, O.** Send for circulars.



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Will roast 30 to 40 lbs. at once, and can be used as a stove at other times. Send for descriptive list to Manufacturers.

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Between these extreme sizes we have open for inspection our immense stock of odd and regular sizes of Tin Plates of all grades, qualities and thicknesses, ranging from number 38 to number 12 gauges.

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From 6 Inches to 40 Inches, 10 to 8X Thickness, No. 30 to No. 20 Gauge, 3 Ounces to 30 Pounds Weight.

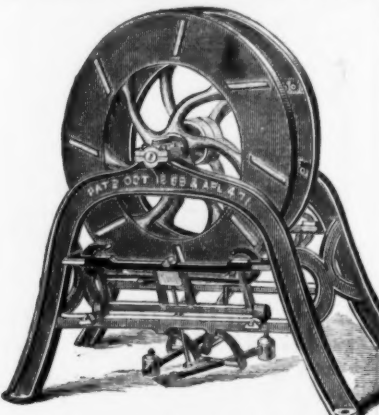
These are all stamped out, by correct dies, from the very finest quality of Charcoal Plates, and afterward tinned.

Send for our illustrated catalogue, descriptive circulars and price lists.

When desiring any information on Tin Plate, it will be to your advantage to write us.

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The most Simple, Durable and Perfect Jointer made. In four sizes, jointing from 16 to 46 inches in length. In use from Maine to California. Is used by the largest stave and barrel manufacturers in the world. Will pay for itself in 90 days in saving of time and timber over any Saw Jointer ever used. Send for circular to.

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MANUFACTURERS OF

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**HARDWARE.**

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Manufacturer of Patent

**BRASS  
Pad Locks,**

FOR

**Railroad Switches,  
Freight Cars,  
AND THE HARDWARE TRADE**

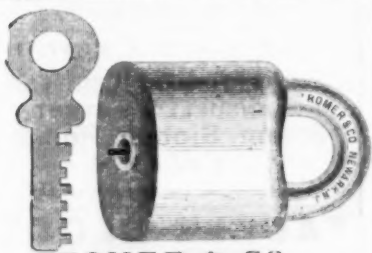
All sizes, with Brass and Steel  
Keys, with and without chains.

**PASSENGER CAR LOCKS,**

Bronzed, Nickel-Plated and Japanned.

**BROOKLYN, N. Y.**

Illustrated Catalogue and Samples sent upon application.



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which were shown by Dillwyn Smith at the Centennial Exhibition in the British section, and obtained the medal and highest award, are now offered to the users of steam in the United States, by the "United States Automatic Stoker Co." under a license from Dillwyn Smith, for use on land boilers, with full confidence that the satisfactory results obtained in Great Britain and on the Continent of Europe (where over 1200 of them are in use), will be fully realized here. Some of these results are: The generation of from 25 per cent. and upward of steam from a given grate surface above what is obtained from the same quality of fuel fed by hand. The lessening of the cost of steam from 10 to 30 per cent. from being able with the Stokers to properly burn a lower priced fuel. The entire removal of the smoke nuisance. The lessening of the labor of the fireman. Their use also materially reduces the temperature of the fire room and also prevents the injury to the boiler caused by the contraction and expansion of the plates resulting from the frequent opening of the fire doors in hand firing. These and other advantages have secured their introduction into the boilers of many of the largest Mills and Iron Works in England and other countries, and we are now turning out an average of 10 machines per week. A few letters are given from some of those having them in use, the statements in which can be implicitly relied upon. For information respecting price, &c., apply to

**THE UNITED STATES AUTOMATIC STOKER CO.,**

**DILLWYN SMITH, President, 2 Chestnut St., Philadelphia.**

**LAND MACHINES.**

From A. M. Collins, Son & Co.'s Factory, Third and  
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DILLWYN SMITH, Esq.—Dear Sir: After several months' experience with your Automatic Stokers, we take pleasure in stating that they have proved entirely satisfactory to us. The saving in cost of fuel we estimate at 20 per cent. Increased amount of steam fully 20 per cent. beside giving us a very regular supply, the variation not being appreciable on steam gauge. Hoping you may be successful in introducing them into general use in this country, we remain  
Yours, truly,  
A. M. COLLINS, SON & Co.,  
Wigan Coal and Iron Company.

Wigan, September 29, 1875.  
Dear Sir: I have pleasure in certifying that the

Stokers applied to our boilers at Kirkless have worked to our satisfaction, and have effected a saving in fuel. Be good enough to put in hand a x more for the range of boilers at our Alexandria Fil.  
I remain, yours, truly,  
W. H. HEWLETT.

From J. R. Jones, Esq., Atkinson Paper Mills, Holgate.

Your Stokers answer my purpose; without them I could not have obtained that regular supply of steam throughout the day. I formerly used coal; with the Stoker I use slack, and save fully 25 per cent. in cost of fuel. They are suitable for all boilers.

The Earl of Dudley's Round Oak Works,  
Birmingham, 6th March, 1876.

I have much pleasure in stating that the Stokers you have fixed at these Works are giving most satisfactory results. The first you put down convinced me that we

could use it for burning the fine siftings or dust from the slack; and those you have since erected have fully confirmed me in that opinion, for not only do we now use the siftings we could not previously burn at all, but the generation of steam is so rapid that we have discontinued using one of the boilers, finding we can obtain, by the aid of your Machine, quite as much steam from three boilers as we previously could from the four.  
Yours, truly,  
R. SMITH CARSON.

Hard Mills, Ashton-under-Lyme,  
24th September, 1875.

Dear Sirs: We have had your Patent Mechanical Stokers in our use for some time, and find they work to our entire satisfaction, and effect a considerable saving in coal.  
Yours, respectfully,  
CLIDHAM WHITTAKER & SONS,  
Per W. THORP.

Note.—They have ten double Machines at Work.

### A NEW Drawer Lock. THE "STANDARD."

Applicable also to Cupboards, etc.

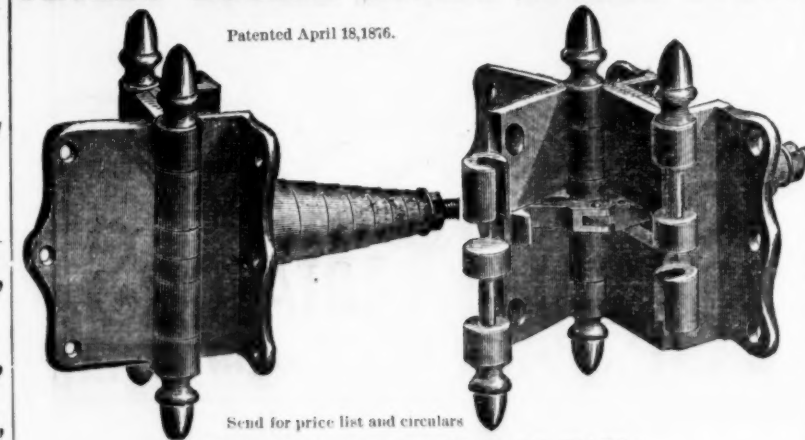
Made wholly of Brass, and finely finished. Each Lock has two flat, steel, nickel-plated Keys.

Dealers desiring to examine this Lock will receive a sample without charge, by addressing

**The Yale Lock Mfg. Co.**  
STAMFORD CONN.

### PATENT DOUBLE ACTING SPRING BUTTS.

Patented April 18, 1876.



FOR SWINGING DOORS BOTH WAYS.

These Butts are the first ever constructed with two leaves only, and with flanges attached thereto, for fastening to the door and casing, thus rendering them much more substantial and easy to put on, as the screws are all driven from the outside. By means of the flanges the door is hung firmly to the casing. Instead of a strip of iron between with all other double acting Butts, and the screws do not become loose, as the strain on them is much less. On the back of the Butt is a powerful coiled spring, and draws in direct line with the center of the door, thus holding the door firmly in position, and obviating all sag. Our price list is from 25 to 40 per cent. lower than others. Manufactured by

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Newman's Pat. Mining Machines,  
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Wall Saws or Cylinder Rings,  
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B. D. Hangers and Rail,  
Shelf Brackets,  
Coat, Harness, Wardrobe and School House  
Hooks,  
And Builders' Hardware generally.

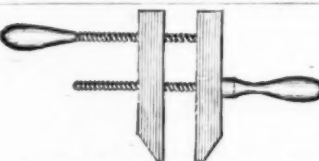
Send for catalogue and price list.

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1st. It can be used as an ordinary Smoothing Iron. 2d. It is a fluting Machine as well as a Smoothing Iron. 3d. The Fluting Attachment being made of brass and convex in form, it has all the advantages of the crank machine. 4th. It combines the two articles in one, taking up the room of but one machine, and is always ready for use.

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Illustrated Catalogue and prices furnished on application.  
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The Cheapest and most Durable Paint known for Cars, Roofs, Bridges, Iron, Brick and Wooden Buildings, etc. All Paint guaranteed as represented, and trial orders solicited.

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Iron Paint Co.,  
PITTSBURGH, PA.

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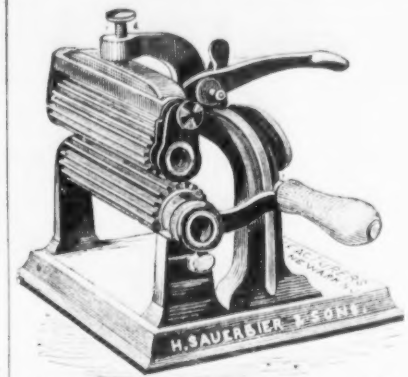
Practically impossible to explode. Tested to 30 lbs. pressure per square inch. Will melt 2 inch seasoned oak—grind handles corn per hour. Price \$250. Also, Stationary Engines and Boilers and Spark Arresting Portable Engines, for plantation use. Send for our circular. Discount to the trade.

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**Babcock's Sash Fastener,**  
PATENTED JAN. 11, 1876.

Needs but to be seen to be Appreciated.  
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State Rights For Sale.



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FLUTING MACHINES.**

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Extra Rollers—8 in. \$2.25; 6 in. \$1.50; 4 in. \$1.25.  
Plates—10, 12, 15, 18, 21, 24, 27 & 30, less discount.

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tending the Railroad Track Scale Patent. Sir Wil-

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Instrument, and Mr. Corlies in patenting the novel-

ties in the Centennial Exhibition Engine.

### PATENTS.

F. A. LEHMANN, Solicitor of Patents, Washington,  
D. C. No Patent, No Pay. Send for circular.

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Sigs, Doors, Number and Finger plates enameled in  
any color and decorated in any style.

Illustrated Catalogue furnished on application.

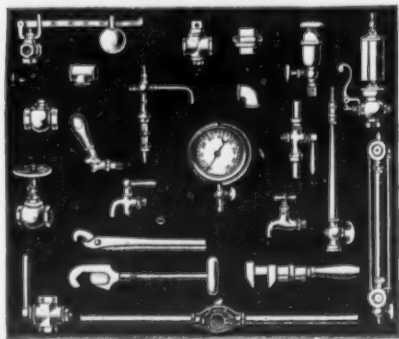
Plumbers' Materials, and every description of Wrought  
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Wrought Iron  
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RADIATORS  
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Brass & Iron  
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**Wrought Iron Boiler Tubes,**

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Saving of 25 per cent. dead weight, and increase of 50 per cent. in strength.

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FOR

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A Perfect Working Self-Adjusting Iron Plane,  
3-4 inches long, with 1 inch Cutter.

The Little Victor is the most perfect Toy Plane ever invented. It is not a mere toy, but will be found useful in every house, shop, factory, store, bank, insurance office, printing office, &c. It is the best pencil sharpener in the world, and especially adapted to Eastern Making and Scroll Saw Work. It is an article of real value and practical utility, and sells on its merits.

We make nothing but Standard Goods.

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No. 5, Complete Adjustm't, Jap. ea. 45c., doz. \$5  
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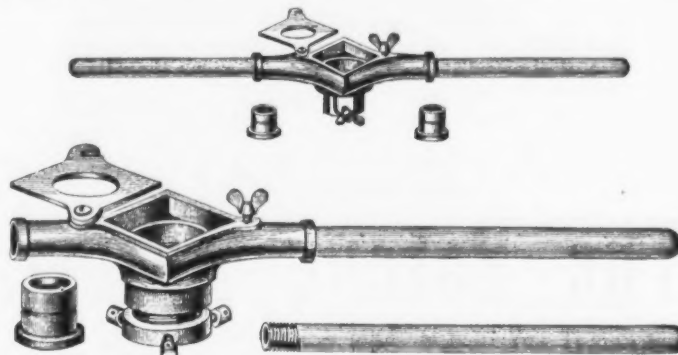
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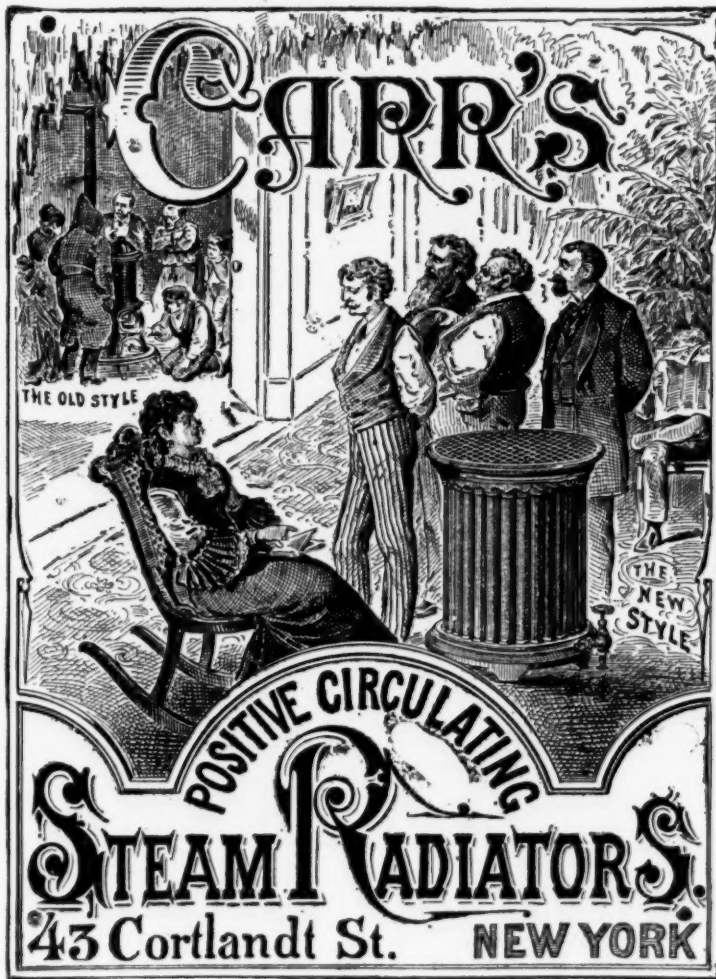
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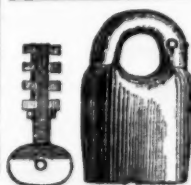
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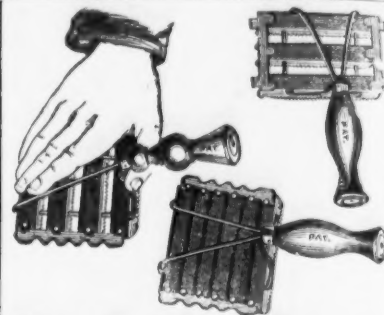
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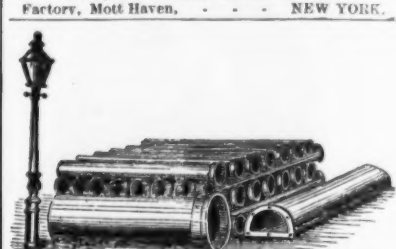
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Branch Works, Tacony, Philadelphia.

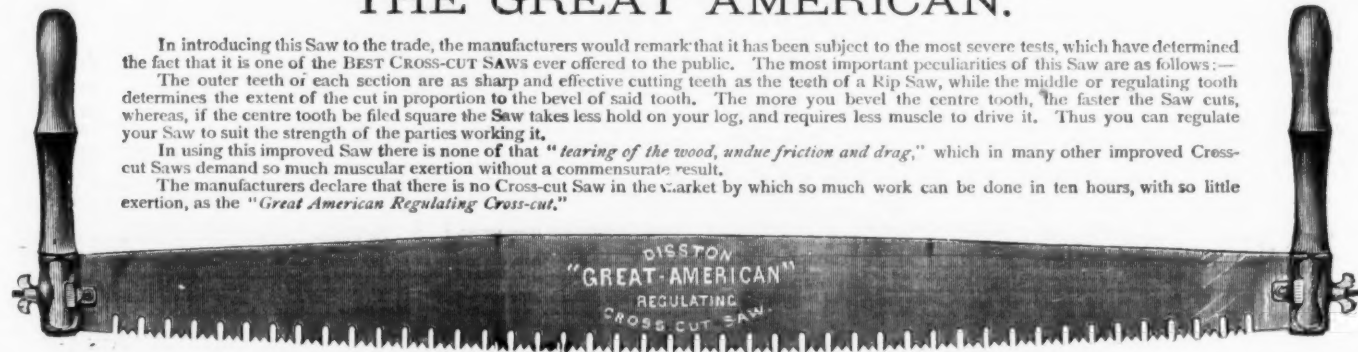
Branch House, Randolph & Market Streets, Chicago, Ill.

## Our Celebrated CROSS-CUT AND WOOD SAWS.

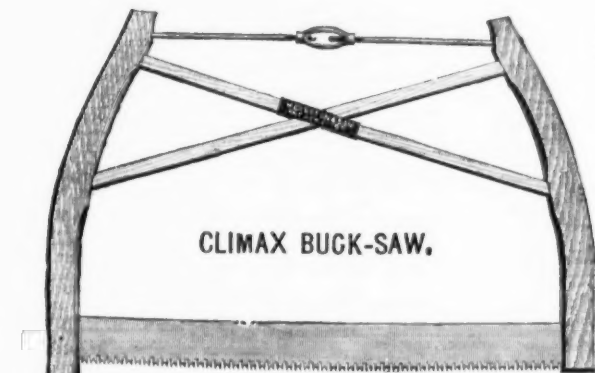


All of our Wood Saw Blades, whether Framed or Otherwise, are  
**SET AND SHARPENED READY FOR USE.**

### THE GREAT AMERICAN.

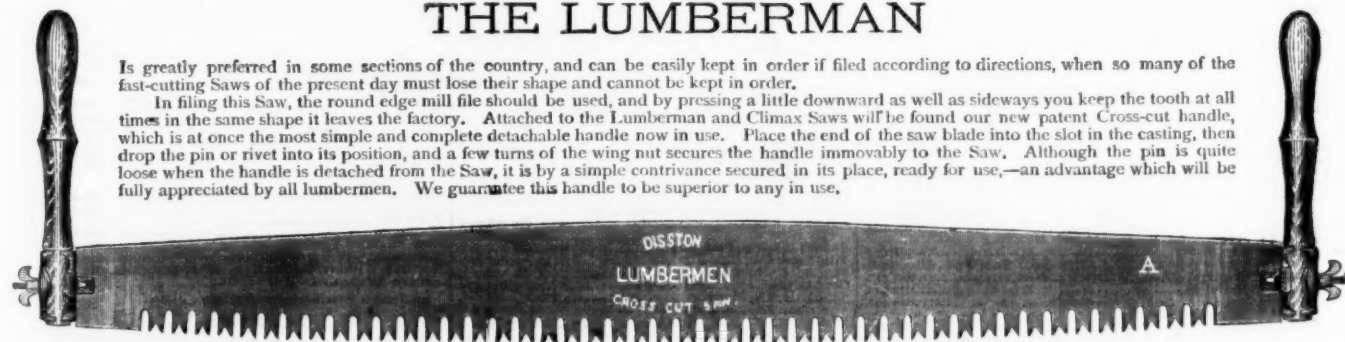


In introducing this Saw to the trade, the manufacturers would remark that it has been subject to the most severe tests, which have determined the fact that it is one of the BEST CROSS-CUT SAWS ever offered to the public. The most important peculiarities of this Saw are as follows:—  
The outer teeth of each section are as sharp and effective cutting teeth as the teeth of a Rip Saw, while the middle or regulating tooth determines the extent of the cut in proportion to the bevel of said tooth. The more you bevel the centre tooth, the faster the Saw cuts, whereas, if the centre tooth be filed square the Saw takes less hold on your log, and requires less muscle to drive it. Thus you can regulate your Saw to suit the strength of the parties working it.  
In using this improved Saw there is none of that "tearing of the wood, undue friction and drag," which in many other improved Cross-cut Saws demand so much muscular exertion without a commensurate result.  
The manufacturers declare that there is no Cross-cut Saw in the market by which so much work can be done in ten hours, with so little exertion, as the "Great American Regulating Cross-cut."

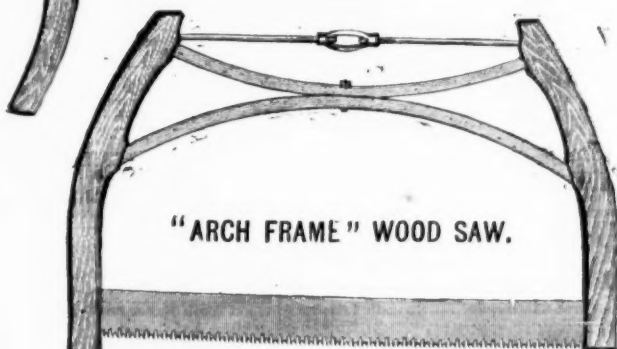


CLIMAX BUCK-SAW.

### THE LUMBERMAN

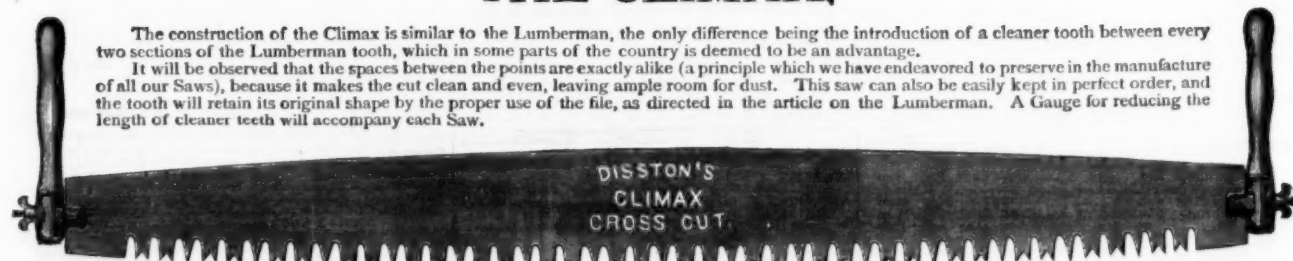


Is greatly preferred in some sections of the country, and can be easily kept in order if filed according to directions, when so many of the fast-cutting Saws of the present day must lose their shape and cannot be kept in order.  
In filing this Saw, the round edge mill file should be used, and by pressing a little downward as well as sideways you keep the tooth at all times in the same shape it leaves the factory. Attached to the Lumberman and Climax Saws will be found our new patent Cross-cut handle, which is at once the most simple and complete detachable handle now in use. Place the end of the saw blade into the slot in the casting, then drop the pin or rivet into its position, and a few turns of the wing nut secures the handle immovably to the Saw. Although the pin is quite loose when the handle is detached from the Saw, it is by a simple contrivance secured in its place, ready for use,—an advantage which will be fully appreciated by all lumbermen. We guarantee this handle to be superior to any in use.



"ARCH FRAME" WOOD SAW.

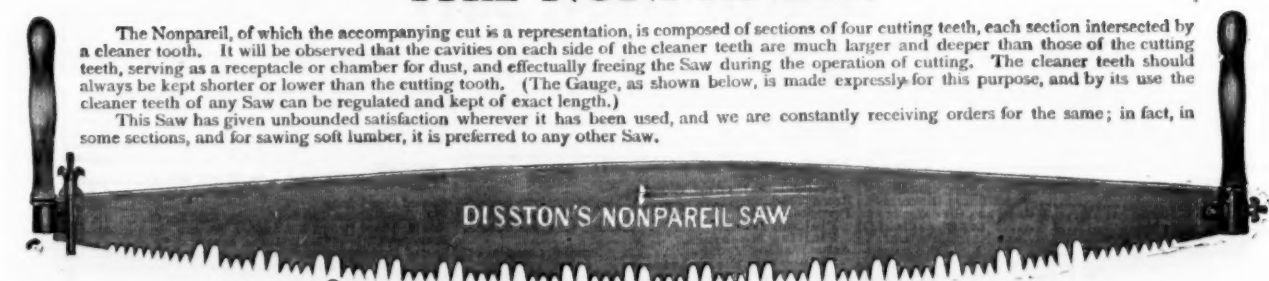
### THE CLIMAX.



The construction of the Climax is similar to the Lumberman, the only difference being the introduction of a cleaner tooth between every two sections of the Lumberman tooth, which in some parts of the country is deemed to be an advantage.  
It will be observed that the spaces between the points are exactly alike (a principle which we have endeavored to preserve in the manufacture of all our Saws), because it makes the cut clean and even, leaving ample room for dust. This saw can also be easily kept in perfect order, and the tooth will retain its original shape by the proper use of the file, as directed in the article on the Lumberman. A Gauge for reducing the length of cleaner teeth will accompany each Saw.



### THE NONPAREIL.



The Nonpareil, of which the accompanying cut is a representation, is composed of sections of four cutting teeth, each section intersected by a cleaner tooth. It will be observed that the cavities on each side of the cleaner teeth are much larger and deeper than those of the cutting teeth, serving as a receptacle or chamber for dust, and effectually freeing the Saw during the operation of cutting. The cleaner teeth should always be kept shorter or lower than the cutting tooth. (The Gauge, as shown below, is made expressly for this purpose, and by its use the cleaner teeth of any Saw can be regulated and kept of exact length.)  
This Saw has given unbounded satisfaction wherever it has been used, and we are constantly receiving orders for the same; in fact, in some sections, and for sawing soft lumber, it is preferred to any other Saw.



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" " Shouldered Peg.....	per gross	25c	15c	
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Ten Eyck Axle Mfg. Co.....	per doz	15c	25c	
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" " Extra Heavy.....	per doz	15c	25c	
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" " Swiss.....	per doz	15c	25c	
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Gong, Abbe's.....	per doz	15c	25c	
" " Yankee.....	per doz	15c	25c	
Crank, Taylor's.....	per doz	15c	25c	
" " Brook's.....	per doz	15c	25c	
" " Connel's.....	per doz	15c	25c	
Lever, Sargent's.....	per doz	15c	25c	
" " Taylor's.....	per doz	15c	25c	
" " Janneped Lever.....	per doz	15c	25c	
" " Hart, Blyven & Mead Mfg. Co.....	per doz	15c	25c	
Full.....	per doz	15c	25c	
" " Brook's.....	per doz	15c	25c	
" " Western.....	per doz	15c	25c	
Call.....	per doz	15c	25c	
Gow, Common Wrought.....	per doz	15c	25c	
" " Western.....	per doz	15c	25c	
" " Kentucky "Star".....	per doz	15c	25c	
" " Dodge's Genuine Kentucky, new list.....	per doz	15c	25c	
" " Nos. 0, 1, 1 1/2, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.....	per doz	15c	25c	
" " Texas.....	per doz	15c	25c	
" " "Genuine".....	per doz	15c	25c	
<b>Bellows.</b>				
Blackiston, Common.....	per doz	20c	25c	
" " Extra and Pittsburgh Pattern.....	per doz	20c	25c	
<b>Boulders.</b>				
Blackiston.....	per doz	15c	25c	
<b>Brad Adjusters.—Domestic.....</b>	per doz	15c	25c	
<b>Brad Fasteners.</b>				
Blackiston.....	per doz	15c	25c	
Van Sand's.....	No. 200, 15c; 1,000, 25c			
" " old pattern.....	per doz	15c	25c	
Washburn.....	per gross	15c	25c	
Merriman's.....	per gross	15c	25c	
Security Blind Fast.....	per gross	15c	25c	
<b>Blind Stamps.</b>				
Blackiston, Patent, 1/2 in. and larger.....	per doz	15c	25c	
" " 1/2 in. and larger.....	per doz	15c	25c	
<b>Blocks.</b>				
Differential Pulley Blocks.....	per doz	15c	25c	
Stable, Rope and Iron Strapped, Providence Tool.....	per doz	15c	25c	
Co.'s List.....	per doz	15c	25c	
Tackle.....	per doz	15c	25c	
<b>Blowers.</b>				
Keystone Portable Forge Co.....	per doz	15c	25c	
<b>Cast Iron Barrel, Shutter, &amp;c.....</b>	per doz	15c	25c	
Cast Iron Barrel.....	per doz	15c	25c	
" " Square.....	per doz	15c	25c	
" " Shutter.....	per doz	15c	25c	
" " Sargent's new list, ditto.....	per doz	15c	25c	
" " Flush, Stanley's.....	per doz	15c	25c	
Carriage and Tire, Conn. & Co.....	per doz	15c	25c	
" " Norway Iron.....	per doz	15c	25c	
" " Philadelphia.....	per doz	15c	25c	
" " Colema.....	per doz	15c	25c	
" " Shelton's.....	per doz	15c	25c	
Star (Phila.) Nut Company, old list.....	per doz	15c	25c	
Stove—American Screw Co.....	per doz	15c	25c	
" " Shelton's Shaved Head.....	per doz	15c	25c	
Flow.....	per doz	15c	25c	
Machine.....	per doz	15c	25c	
Boiler.....	per doz	15c	25c	
<b>Boring Machines. Upright. Angular.</b>				
Novy's, no Augers.....	\$5.00	\$8.00	net	
Sargent & Co.....	5.00	8.00	net	
Parr's, no Augers.....	5.00	7.50	30c	
Kello's, with Augers.....	7.50	10.00	30c	
Sweets.....	3.75	4.00	net	
" " with Augers.....	5.00	6.00	net	
Phillips with Augers.....	10.00	25c	5c	
<b>How Pins.</b>				
Hutchinson.....	per doz	15c	25c	
Hutchinson, Beckley & Co.'s.....	per doz	15c	25c	
Hutchinson, Beckley & Co.'s.....	per doz	15c	25c	
Hutchinson, Beckley & Co.'s.....	per doz	15c	25c	
Hutchinson, Beckley & Co.'s.....	per doz	15c	25c	
Hutchinson, Beckley & Co.'s.....	per doz	15c	25c	
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Hutchinson, Beckley & Co.'s.....	per doz	15c	25c	
Hutchinson, Beckley & Co.'s.....	per doz	15c	25c	
Hutchinson, Beckley & Co.'s.....	per doz	15c	25c	
Hutchinson, Beck				

Boston Finish, Plain, with Iron Acorns.....	dls 6 & 8c
" " " " " " " " " " " " " " " "	dls 7 & 10c
" " " " " " " " " " " " " " " "	dls 6 & 10c
Fast Joint, Narrow, with Silvered Iron.....	dls 40 c
" " " " " " " " " " " " " " " "	dls 30 c
" " " " " " " " " " " " " " " "	dls 30 c
Loose Joint, Broad, with Iron Acorns.....	dls 30 c
Table Butts, Back Flaps, &c.....	dls 35 c
Inside Blind, Regular.....	dls 35 c
Loose Pin, Wrt., Light.....	dls 40 c
Air, Spiral Spring Butt Co., Japanned.....	dls 25
Sabin Mfg. Co., Double Acting.....	dls 35
Union Spring Hinge Co.....	dls 25
Hicks & Gottschalk's Socket.....	dls 30 c
Blind Butts, Parker.....	dls 30 c
" " Palmer.....	dls 30 c
" " Shepard.....	dls 60
" " Lull & Porter.....	dls 60
" " Huffer.....	dls 35 & 40
" " Garretson.....	dls 60
" " Clark's..... Nos. 2, 4, 4½, 6, 8, 10.....	dls 30 c
" " Sargent's.....	dls 70 & 85 c
In Openers.....	
Messenger's Comet.....	¥ doz \$3.00, dls 50 c
American.....	¥ doz \$2.25, dls 50 c
No. 4, French.....	¥ doz \$2.25, dls 50 c
No. 5, Iron Handle.....	¥ doz \$2.25, dls 50 c
Sprague's.....	¥ doz \$2.00, 2-25, 2-50, dls 50 c
Eureka.....	¥ doz \$2.50, dls 50 c
Star.....	¥ doz \$2.50, dls 50 c
Cups—Percussion, ¥ 1000.....	
Hicks & Gottschalk's..... D. & S. R.....	37 c
" " E. B. 1-to Ground.....	50c, dls 50
" " E. B. 1-to Turned.....	70c, dls 50
" " C. W. P. 14.....	1.35, dls 50
" " D. W. P. 14.....	.70c, dls 50
Ely's, B. B.....	70c, dls 50
" " Double Waterproof, 1-in. B. & P.; 1-in. B. & P.....	\$1.25, doz 100
Colt's.....	\$1.25, doz 100
Carnds.—Horse and Curry.....	dls 30 c
Cotton.....	dls 10 c
Carpet Stretchers.....	¥ doz \$5.00, dls 30 c
Cast Steel, Polished.....	¥ doz \$2.00, dls 30 c
Canstets.....	
Bed.....	dls 55 c
Deep Socket.....	¥ doz \$2.00, dls 40 c
Cattle Leaders.....	dls 10 c
Hamuson, Beckley & Co.'s.....	dls 60 c
Uglt's Co.....	dls 10 c
Chain.....	
Trace, 60-ft..... by the case, ¥ pair, gold, 50 c	50 c
German Hair Chain.....	dls 30 c
Collar.....	dls 30 c
Galvanizing.....	dls 30 c
Jack Chain, Iron.....	dls 50 c
" " Brass.....	dls 10 c
Chalk.....	
White.....	¥ gross 50 net
Red.....	¥ gross 75c net
Dry.....	¥ gross 13½c net
Chisels.....	
White, Best Tool Co. (all kinds).....	dls 20 c
Socket Framing, Crossman.....	dls 60 c
" " Buck Bros., new list, dls 17½ c	17½ c
" " Merril.....	dls 60 c
" " Witherby Tool Co.....	dls 60 c
" " Firmers.....	dls 60 c
" " Buck Bros., new list, dls 17½ c	17½ c
" " Hart Mfg. Co., No. 1.....	dls 60 c
" " Merril.....	dls 60 c
" " Witherby Tool Co.....	dls 60 c
" " Corner.....	dls 60 c
Tanged Firmers Extra.....	¥ doz \$2.25 to \$2.00
" " Newbuild's.....	5-50 to \$2.00
" " Buck Bros. (Shank).....	5-25 to \$2.00
Clamps.....	
Iron, Providence Tool Co.'s, Wrt. Iron.....	dls 20 c
" " Adjustable, Gray's.....	dls 20 c
" " Lambert's.....	dls 20 c
" " Copeland's.....	dls 20 c
" " Hammer.....	dls 15 c
" " Cabinet, Sargent's.....	dls 60 c
" " Makers', Sargent's.....	dls 60 c
Coffee Mills.....	
Board and Box.....	dls 35 c
Gold Coll.....	dls 35 c
Selso's Pat.....	¥ \$2.50, \$10.50, dls 25
American Enterprise Mfg. Co.....	dls 25
The Swift.....	dls 25
Compases and Dividers.....	dls 35 c
Bentley & Co's.....	dls 15 c
Cook's.....	dls 15 c
Excelsior.....	dls 40 c
Curbing Tools.....	
Carpenter's.....	¥ doz 7.50, dls 15 c
D. R. Barton Tool Co.....	dls 20 c
Corkscrews, Humason & B.....	dls 33½ c
Bradley's.....	dls 10 c
Crow Bars.....	
Iron, Steel Points.....	¥ doz 30 c
Crucibles, Gautier & Co.....	¥ No. 550 c
Curling Irons.....	dls 10 c
Curving Tools.....	¥ doz \$6.50, dls 15 c
Curry Comb.....	¥ doz 7.50, dls 15 c
Curry Comb Comp.....	dls 25 c
Hotchkiss & Kellogg's, Iron & Brass, old list, dls 47½ c	47½ c
Hotchkiss' Novelty.....	dls 10 c
Wood Tooth (Flat Bro.).....	¥ doz \$2.25, net
Clips, Aale.....	¥ doz \$2.25, net
Norway or Best.....	dls 25 c
Cockeyes 1¼ in., 20c; 1¾ in., 30c; 1¾ in., 30c, net	dls 25 c
Cocks.....	
Brass Facking.....	dls 25 c
Lever Bibbs.....	dls 25 c
Alve and Beer.....	dls 45 c
Cutlery.....	
Meriden Cutlery Co. (Table).....	net
Naughtcut Cutlery Co.....	list net
New York Knife Co. (Pocket).....	dls 45 c
Rogers Cutlery Co.....	net
Humason & Beckley Mfg. Co.....	dls 25 c
Britannia.....	¥ doz \$3.75 to \$4.25, net
Cocoa, Plain.....	¥ doz \$3.75, dls 25 c
Dog Gilt.....	¥ doz \$3.75, dls 25 c
Embossed Gift.....	dls 25 c
Brushes.....	
Trass.....	dls 25 c
Door Springs.....	
Johnson's Rod.....	¥ doz \$2.00, net
No. 1, Large, Japanned.....	¥ doz \$3.50, net
No. 2, Medium.....	¥ doz 2.50, dls 15 c
Challenge (Coil).....	Nos. 9 7 6
Japanned.....	¥ doz \$7.50, 2-50, 3-50, dls 15 c
Galvanized.....	¥ doz 3.50, 4-00, 4-50, dls 15 c
Nickel.....	¥ doz 5.50, 6-00, 7-00, dls 15 c
Premium.....	¥ doz \$7.50, 6-25, 5-00, dls 25 c
Nickel.....	¥ doz 11.00, 9-00, 8-00, list,
Star.....	¥ doz \$12.00, 10-00, 9-00, list,
No. 5, Small.....	¥ doz \$2.00, dls 15 c
No. 6, Medium.....	¥ doz 2.50, dls 15 c
No. 7, Large.....	¥ doz 3.50, dls

Wellington Mills, Grain. . . . . \$ 10 per ton  
**Enamelled and Tinned Ware.**  
 Kettles, No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832,

Screw Hook and Strap..... \$ 8.00, 12 in. 11c, 16 in. 40c  
Heavy Welded Hook..... \$ 14 to 13 in. 11c, 6"..... .dis 3  
Screw Hook and Eye..... \$ 1/4 in. to 1 in. 13c..... .dis 3  
**Hoses.**  
Solid Shank, C. S..... \$ per doz..... .dis 40  
River Hose..... \$ per doz..... .dis 40  
Grub..... \$ per doz..... .dis 30  
Pump Hose..... \$ per doz..... .dis 30  
Scovill Pattern..... \$ per doz..... .dis 20 3/4  
Lane's C. S. Crescent Planters, Amer. Pat'n..... .dis 20 3/4  
Handled Solid C. S. Shaft..... \$ per doz..... .dis 30  
Planters, Handled..... \$ per doz..... .dis 30  
Scovill Pattern, Handled..... \$ per doz..... .dis 30  
**Hardware.**  
Bird Cage, Sargent's list..... \$ per doz..... .dis 60 1/2  
Belt..... \$ per doz..... .dis 60 1/2  
Bench-Hotchicks, \$5.00 \$ per doz..... .dis 10  
" Weston's No. 1, \$2.00; No. 2, \$7.00..... .dis 10  
" Skinner's, \$6.25 per doz..... .dis 20  
Clothes Line, Hart's list..... \$ per doz..... .dis 60 1/2  
" Reading list..... \$ per doz..... .dis 35 1/2  
Ceiling..... \$ per doz..... .dis 60 1/2  
Harness, Sargent's list..... \$ per doz..... .dis 60 1/2  
" Reading list..... \$ per doz..... .dis 60 1/2  
Coat and Hat, Hart's list..... \$ per doz..... .dis 60 1/2  
" Sargent's list..... \$ per doz..... .dis 60 1/2  
" Reading..... \$ per doz..... .dis 60 1/2  
Wrought Staples and Hooks and Staples..... \$ per doz..... .dis 70 1/2  
Wire Screw Hooks and Eyes..... \$ per doz..... .dis 70 1/2  
Whiffletree..... \$ per doz..... .dis 60 1/2  
Hooks and Eyes-Malleable Iron..... \$ per doz..... .dis 60 1/2  
**Horse Nails.**  
Nos. 5 6 7 8 9  
Ausable..... \$ per 300..... .dis 250  
" P'd and Folded..... \$ per 300..... .dis 250  
" and Blued..... \$ per 300..... .dis 250  
Cortland..... \$ per 300..... .dis 250  
Sargent's..... \$ per 300..... .dis 250  
Buffalo Forge..... \$ per 300..... .dis 250  
Ward's..... \$ per 300..... .dis 250  
National, Pointed and..... \$ per 300..... .dis 250  
Polished, Pat. Fin..... \$ per 300..... .dis 250  
National, Pointed and..... \$ per 300..... .dis 250  
Perkins' P'd-Black..... \$ per 300..... .dis 250  
Polished..... \$ per 300..... .dis 250  
Perkins' Pointed and..... \$ per 300..... .dis 250  
Blued..... \$ per 300..... .dis 250  
Vulcan P'd & Blued..... \$ per 300..... .dis 250  
North Western Plain..... \$ per 300..... .dis 250  
" Flat's..... \$ per 300..... .dis 250  
**Horse Shoes.**  
Burdett..... \$ per doz..... .dis 40 1/2  
R. R. "..... \$ per doz..... .dis 40 1/2  
Medium and Heavy..... \$ per doz..... .dis 40 1/2  
Mule Shoes..... \$ per doz..... .dis 40 1/2  
Pole Feet..... \$ per doz..... .dis 40 1/2  
The Boston Horse Shoe..... \$ per doz..... .dis 40 1/2  
**Ice Awls, Chisels, &c.**  
American Ice Chisel..... \$ per doz..... .dis 60 1/2  
National..... \$ per doz..... .dis 60 1/2  
Novelty Ice Breakers..... \$ per doz..... .dis 60 1/2  
Piercing Sling Head..... \$ per doz..... .dis 60 1/2  
Dunlap..... \$ per doz..... .dis 60 1/2  
Wood Head Picks, Sargent's..... \$ per doz..... .dis 60 1/2  
" Reading list..... \$ per doz..... .dis 60 1/2  
" Mallets, Pick in Head..... \$ per doz..... .dis 60 1/2  
Ice Axes, Small, Cast or Malleable..... \$ per doz..... .dis 60 1/2  
Kitchen Ice..... \$ per doz..... .dis 60 1/2  
**Knives.**  
Brass..... \$ per doz..... .dis 50  
Enameled..... \$ per doz..... .dis 50  
Butcher Knives..... \$ per doz..... .dis 50  
" Bread..... \$ per doz..... .dis 50  
Hay and Straw "Wadsworth's"..... \$ per doz..... .dis 50  
Tapered Foot..... \$ per doz..... .dis 50  
**Knobs.**  
Carriage (d'ap'd cos. & gross)..... \$ per doz..... .dis 60 1/2  
Bass..... \$ per doz..... .dis 60 1/2  
" Flush Tip..... \$ per doz..... .dis 60 1/2  
" Elastic End, No. 3..... \$ per doz..... .dis 60 1/2  
Door..... \$ per doz..... .dis 60 1/2  
" Por. Jan'd..... \$ per doz..... .dis 60 1/2  
" Plated..... \$ per doz..... .dis 60 1/2  
Furniture, Plain..... \$ per doz..... .dis 60 1/2  
Wood Screws..... \$ per doz..... .dis 60 1/2  
**Lades.**  
Melting-Hart's..... \$ per doz..... .dis 50 1/2  
" Reading..... \$ per doz..... .dis 50 1/2  
" Monroe's Patent..... \$ per doz..... .dis 50 1/2  
**Lanterns.**  
No. 6, \$7.00; No. 8, \$12.50..... \$ per doz..... .dis 10  
Peerless..... \$ per doz..... .dis 10  
Brady's Patent..... \$ per doz..... .dis 10  
" American..... \$ per doz..... .dis 10  
" Yankee..... \$ per doz..... .dis 10  
" De Quaker..... \$ per doz..... .dis 10  
Police..... \$ per doz..... .dis 10  
" Small, \$7.50; Large, \$9.00, \$10.00..... \$ per doz..... .dis 10  
**Lard Presses.**  
Drum, 12 in. each..... \$65.00, \$10.00  
Enterprise Mfg. Co..... \$ per doz..... .dis 20  
**Lemon Squeezers.**  
Porcelain Lined..... \$ per doz..... .dis 60 1/2  
Eureka, Tinned..... \$ per doz..... .dis 60 1/2  
Dunlap's Improved..... \$ per doz..... .dis 60 1/2  
" American Patent..... \$ per doz..... .dis 60 1/2  
**Lines.**  
Lithia..... \$ per doz..... .dis 50  
Cotton Chalk..... \$ per doz..... .dis 50  
Silk Lark Chalk..... Nos. 1, 2, 3, \$6.00, \$6.50, \$7.00..... \$ per doz..... .dis 50  
" Mason's..... \$ per doz..... .dis 50  
Wire Clothes Gaid..... \$ per doz..... .dis 50  
Locks and Latches..... \$ per doz..... .dis 50  
Cabinet-Gaylord..... \$ per doz..... .dis 50  
Eagle..... \$ per doz..... .dis 50  
**Trunk.**  
Langstroth & Crane's List Jan. 1, 77..... \$ per doz..... .dis 25  
" Round Key..... \$ per doz..... .dis 25  
" Barnes & Delta, Flat Key..... \$ per doz..... .dis 25  
Yale Lock Co., Flat Key..... \$ per doz..... .dis 25  
" Round Key..... \$ per doz..... .dis 25  
Continental..... \$ per doz..... .dis 25  
Shepardson's..... \$ per doz..... .dis 25  
" American Lock Mfg. Co..... \$ per doz..... .dis 25  
Plate..... \$ per doz..... .dis 25  
**DOOR LOCKS, &c.**  
Brantford..... \$ per doz..... .dis 60 1/2  
Norwalk..... \$ per doz..... .dis 60 1/2  
Russell & Erwin..... \$ per doz..... .dis 60 1/2  
" Russell & Erwin..... \$ per doz..... .dis 60 1/2  
Padlocks-Russell & Erwin..... \$ per doz..... .dis 60 1/2  
" Mallory, Wheeler & Co..... \$ per doz..... .dis 60 1/2  
" American Lock Mfg. Co..... \$ per doz..... .dis 60 1/2  
" Hutton..... \$ per doz..... .dis 60 1/2  
" New York Lock Works..... \$ per doz..... .dis 60 1/2  
" J. H. McWilliams..... \$ per doz..... .dis 60 1/2  
" Wain's..... \$ per doz..... .dis 60 1/2  
" Miller's Patent..... \$ per doz..... .dis 60 1/2  
" Penn Lock Works..... \$ per doz..... .dis 60 1/2  
**Mallets, Hickory and Lignumvitae.**  
**Meat Cutters.**  
Dixon's (P. S. & W.) Nos. 1 2 3 4  
Miles' Challenge..... Nos. 1 2 3 4  
Perry's Nos. 1..... \$ per doz..... .dis 30  
" Nos. 2..... \$ per doz..... .dis 30  
" Nos. 3..... \$ per doz..... .dis 30  
" Nos. 4..... \$ per doz..... .dis 30  
" Nos. 5..... \$ per doz..... .dis 30  
" Nos. 6..... \$ per doz..... .dis 30  
" Nos. 7..... \$ per doz..... .dis 30  
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" Nos. 9..... \$ per doz..... .dis 30  
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" Nos. 74..... \$ per doz..... .dis 30  
" Nos. 75..... \$ per doz..... .dis 30  
" Nos. 76..... \$ per doz..... .dis 3

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# SULZBACHER, HYMAN, WOLFF & CO.,

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Hammered and Rolled STEEL of every description

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Special Steel

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Turns out at least double work by increased speed and feed, and cuts harder metals than any other steel. Neither hardening nor tempering required.

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We have also on hand a general assortment of Hardware.



Choppers, Hand and Power.

Stuffers,

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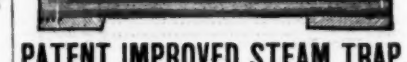
Warranted thoroughly made and

the Best in Use.

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The only self-regulating Steam Trap in the world.

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**SHOE KNIVES.**

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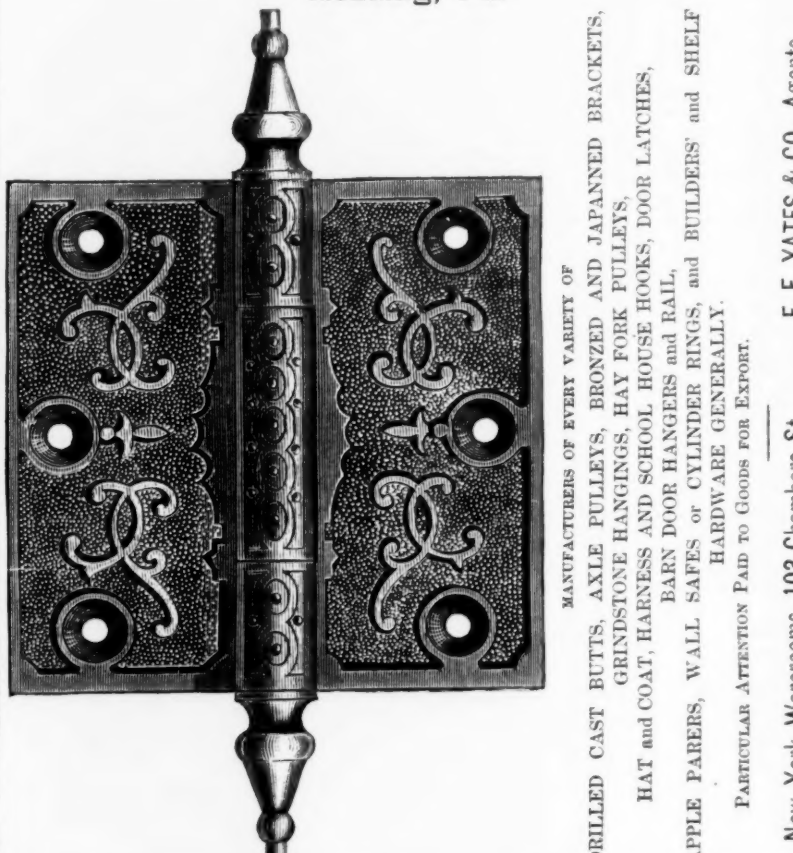
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MANUFACTURERS OF EVERY VARIETY OF  
DRILLED CAST BUTTS, AXLE PULLEYS, BRONZED AND JAPANNED BRACKETS,  
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BARN DOOR HANGERS and RAIL, APPLE PARERS, WALL SAFES or CYLINDER RINGS, and BUILDERS' and SHELF HARDWARE GENERALLY.  
PARTICULAR ATTENTION PAID TO GOODS FOR EXPORT.

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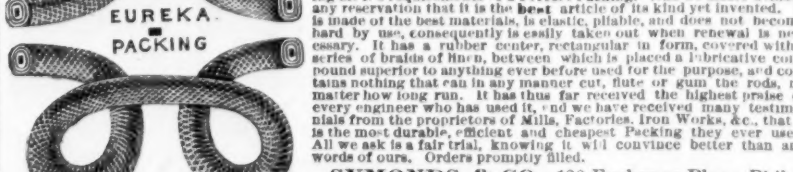
John Wilson's Butcher and Shoe Knives.

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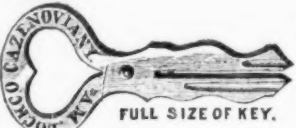
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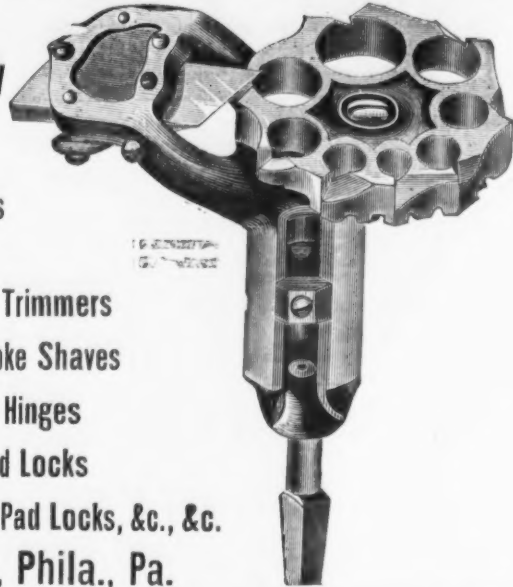
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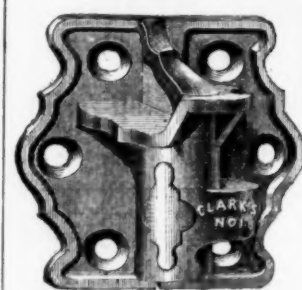
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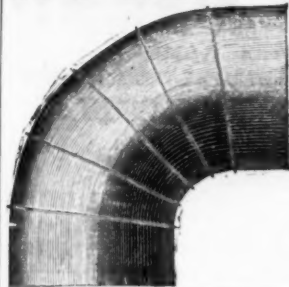
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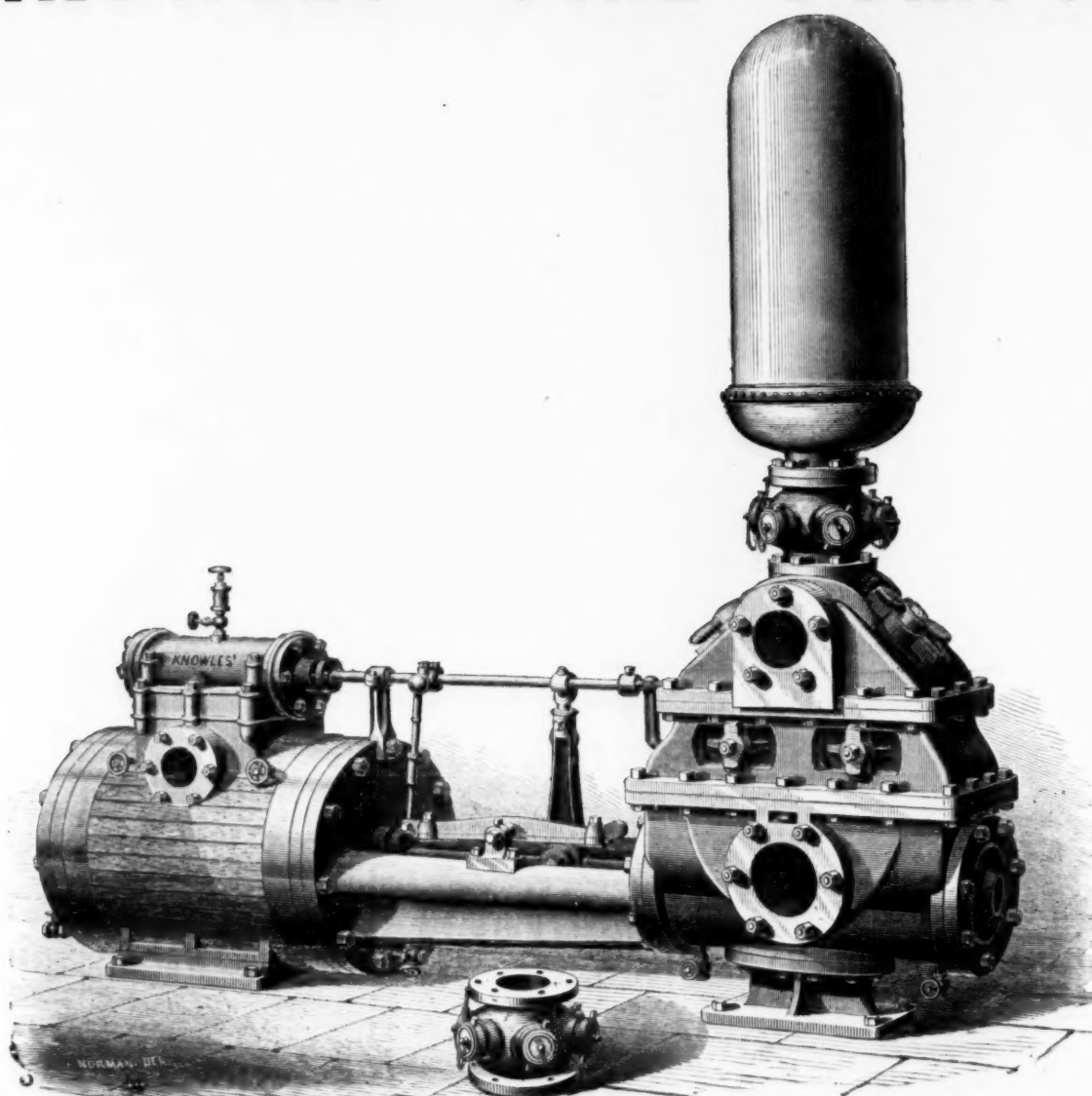


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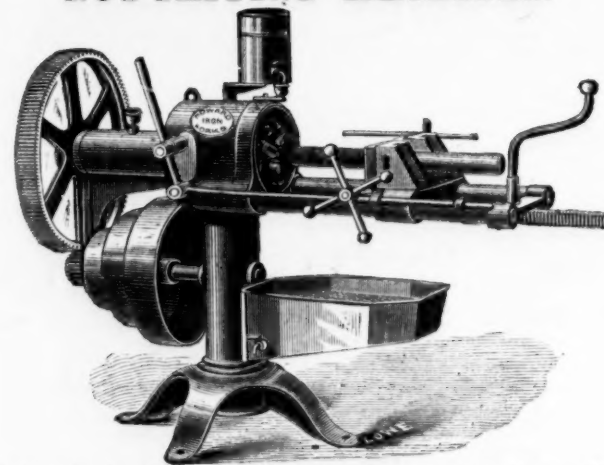
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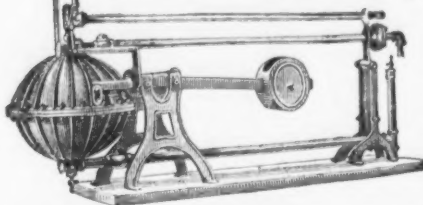
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Size, Inch.	Plain.	Bright Finish.	Extra Speed.	Stop Valve.
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2	18 00	20 00	21 00	..
2 1/2	20 00	22 00	23 00	5 00
3	22 00	24 00	25 00	6 00
3 1/2	24 00	26 00	27 00	8 00
4	26 00	28 00	29 00	10 00
4 1/2	28 00	30 00	31 00	12 00
5	30 00	32 00	33 00	14 00
5 1/2	32 00	34 00	35 00	16 00
6	34 00	36 00	37 00	18 00
6 1/2	36 00	38 00	39 00	20 00
7	38 00	40 00	41 00	22 00
7 1/2	40 00	42 00	43 00	24 00
8	42 00	44 00	45 00	26 00
8 1/2	44 00	46 00	47 00	28 00
9	46 00	48 00	49 00	30 00
9 1/2	48 00	50 00	51 00	32 00
10	50 00	52 00	53 00	34 00

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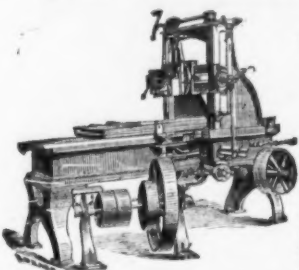
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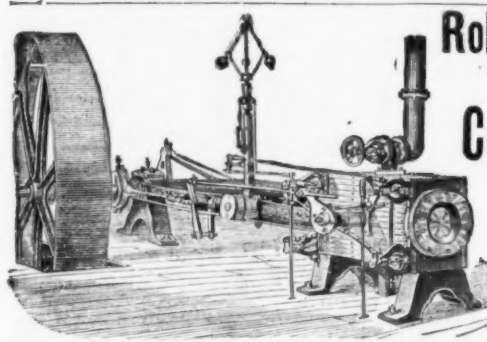
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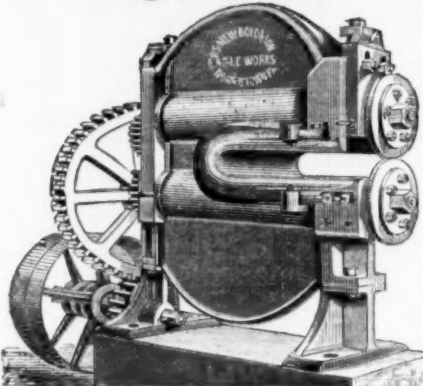
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Rotary Shears for Plates and Circles. A. Wood & Co., Conshohocken, Pa. Ernst Stridberg, Sweden. Lewis Ditzell & Co., Pittsburgh, Pa. H. A. Beale & Co., Parkersburg, Pa. Rolling Mill & Blast Furnace Plants & Engines. Merion Furnaces, Conshohocken, Pa. Aurora Furnace, Wrightsville, Pa. Cokespring Iron Works, New York. Norristown Water Co. Oliver & Co., Easton Sheet Mill. Portstown Iron Co.'s Plate Mill. Parkersburg Flue Mill. Morris, Tasker & Co., Engines. Durand & Marais' French Pat. Brick.

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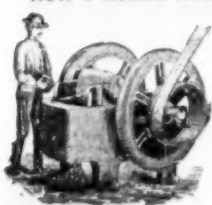
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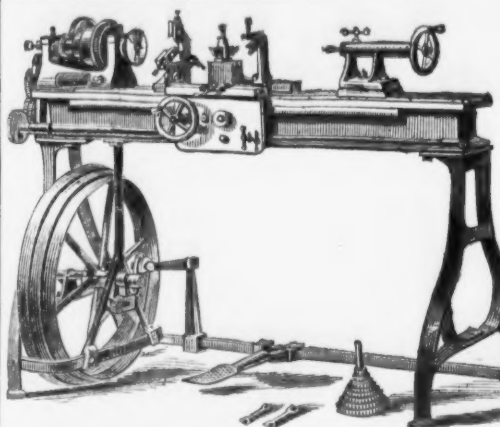
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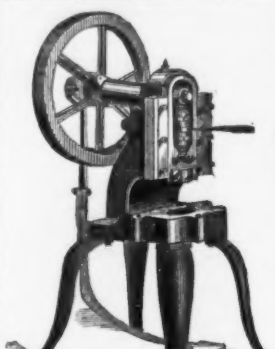
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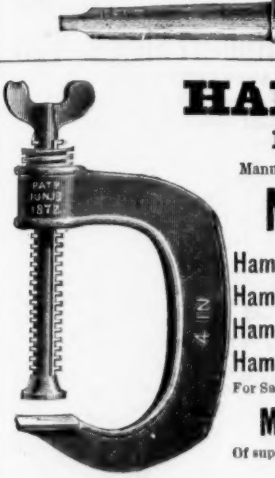
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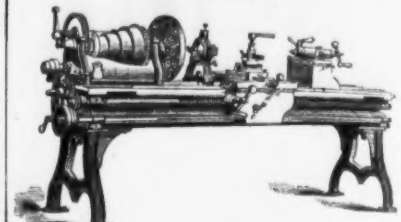
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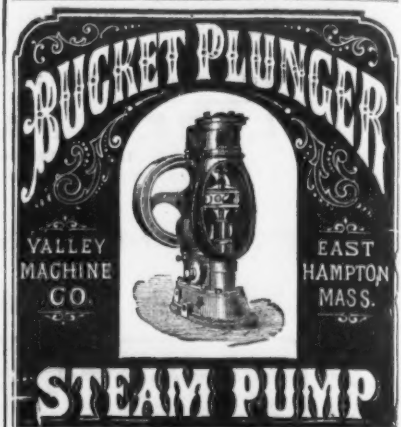
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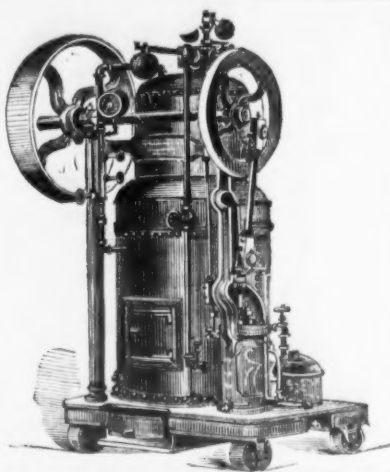
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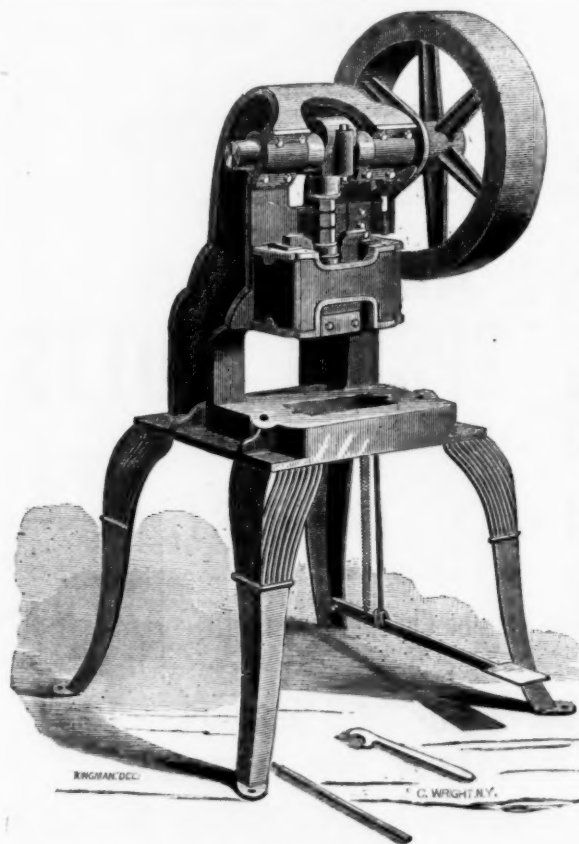
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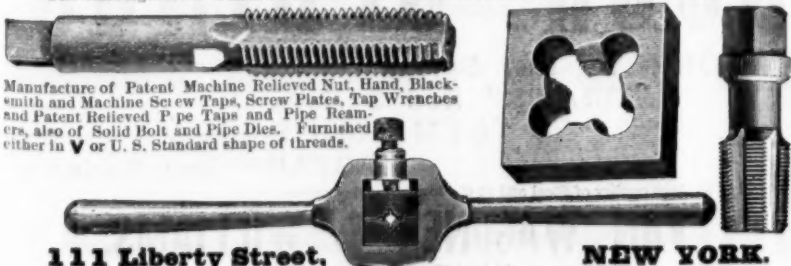
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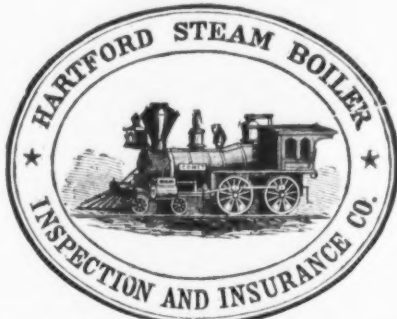
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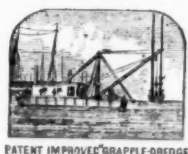
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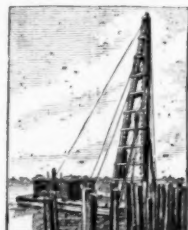
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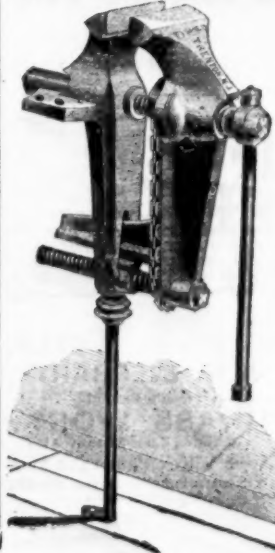
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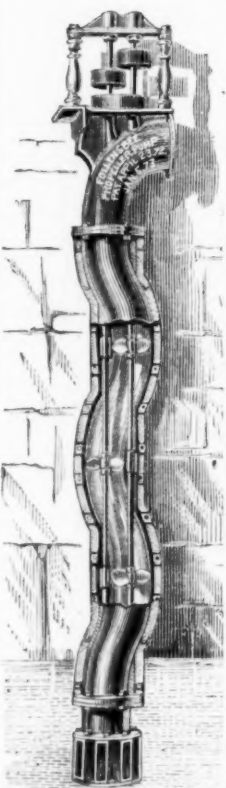
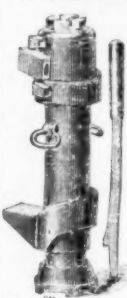
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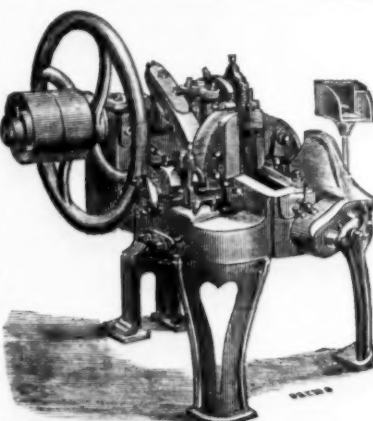
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